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QIS4 Technical Specifications (MARKT/2505/08)

Annex to Call for Advice from CEIOPS on QIS4 (MARKT/2504/08)

References to Articles in the Directive proposal refer to the amended COM proposal 2008/119 published on 26 February 2008.

All Annexes to this document are located at the end of the document except for the IFRS and Proxies annexes which are included in the relevant sections.

The Operational Risk Questionnaire (MARKT 2506/08) is presented in a separate excel file.

All documents relating to QIS4 produced by CEIOPS will be made available on their website (http://www.ceiops.eu/content/view/118/124/) including the QIS4 spreadsheets, CEIOPS' background calibration documents, a document containing a number of examples regarding the Group Specifications, and any national supervisory guidance produced by CEIOPS members.

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DISCLAIMER

The technical specifications laid out in this document have been written exclusively for the purposes of the QIS4 exercise. Whilst the results of this exercise will be the main quantitative input used by CEIOPS in the development of their final advice on potential level 2 implementing measures, which is due in October 2009, CEIOPS final advice will not necessarily reflect the specifications laid out in this document. Indeed, in a number of areas a range of different options are being tested in this exercise and a decision as to the best approach will only be taken after the results of QIS4 have been analysed and discussed. Similarly, the European Commission will only finalise its proposals for level 2 implementing measures once the Solvency II Directive has been adopted by Parliament and Council and it has received advice on potential level 2 implementing measures for Solvency II from CEIOPS in October 2009. Consequently, this text should neither be read as committing CEIOPS with respect to future advice it will provide to the European Commission on level 2 implementing measures, nor the European Commission with respect to future level 2 implementing measures it will propose. Furthermore, whilst every effort has been made to ensure that the technical specifications are consistent with the Solvency II proposal, they should not be used to interpret the Solvency II Directive proposal, or be relied upon as a source of guidance in this regard.

INTRODUCTION

This document sets out the technical specifications to be used for the Fourth Quantitative Impact Study (QIS4), which the European Commission has asked CEIOPS to run between April and July 2008 in the frame of the development of potential future level 2 implementing measures for the Solvency II Directive Proposal.

The reporting date to be used by all participants should be **end December 2007**. Where participants do not have all the information necessary to conduct the solvency assessment on 31 December 2007, they may use 31 December 2006 as the reporting date instead, provided that they indicate this in the QIS4 spreadsheets.

As with previous QIS exercises and in order to maximise participation, participants are invited to take part in the QIS4 exercise on a best efforts basis. However, where alternative approaches are provided for in these specifications, participants are strongly encouraged to provide data on the alternatives, in order to enable a comparative quantitative analysis of the different approaches to be conducted.

In particular, participants are invited to provide feedback on the relative impact of the various simplified calculations for technical provisions and the SCR standard formula laid down in these specifications, as well as the different methods proposed for groups. In addition, participants are also invited to provide quantitative results derived using their own internal model as well as using the SCR Standard Formula.

The simplified calculations are included in boxes to help participants identify them:

Simplifications for participants

Participants are often also "requested" or "invited" to provide additional information regarding the practicality and suitability of the specifications. The most important additional questions and information requests have been highlighted in grey, with a black border.

Important question or information request

General questions on the implementation of QIS4 specifications at solo level

1. What major practical difficulties did you face in producing solo data for QIS4 purposes? Do you have any suggestions on how to solve these problems?

2.

(a) Can you provide an estimate of the additional resources (in fte months) that are likely to be required:

i. to develop appropriate systems and controls at solo level, and

ii. to carry out a valuation each year of the SCR in accordance with the methodology proposed in QIS4 specifications?

(b) What level of resource (in fte months) was required to complete the solo aspects of QIS4?

(c) On what aspect(s) of the solo QIS4 specifications (e.g. technical provisions, SCR) did you dedicate most of your resource when completing the QIS4 exercise?

3. Please provide some assessment of the reliability and accuracy of the data you have input in the QIS4 exercise.

SECTION 1 - VALUATIONS OF ASSETS AND LIABILITIES

This section concerns valuation requirements for:

- assets and other liabilities
- technical provisions

TS.I. Assets and other liabilities

TS.I.A Valuation approach

TS.I.A.1 The Solvency II risk-based philosophy for determining solvency capital requirements endeavours to take account of all potential risks faced by insurance undertakings. One component of this approach is to asses the risk of loss in the value of assets and liabilities (other than technical provisions) held by undertakings. In line with the Framework Directive Proposal, this assessment should be made using an economic, market-consistent valuation of all assets and liabilities.

TS.I.A.2 On this basis, the following hierarchy of high level principles is proposed for the valuation of assets and liabilities under QIS 4:

(i) Wherever possible, a firm must use "mark to market" methods in order to measure the economic value of assets and liabilities;

(ii) Where this is not possible, mark to model procedures should be used (marking to model is any valuation which has to be benchmarked, extrapolated or otherwise calculated from a market input). When marking to model, undertakings will use as much as possible observable and market consistent inputs;

(iii) Firms may opt to follow the guidance in the annexed tables (see TS.III.A and TS.III.B) to determine where the treatment under IFRS is considered an allowable proxy for economic value for the purposes of QIS 4. Where possible, this guidance may also be applied to local GAAP;

(iv) Under the following circumstances national accounting figures may be used (even though these might not reasonably be regarded as a proxy for economic value):

- where a firm can demonstrate that an asset or liability is not significant in terms of the financial position and the performance of the entity as determined under the applicable financial reporting framework and the solvency assessment. (Participants should refer to the materiality principle set out in their applicable financial reporting framework to determine what is deemed significant or not, and apply the same principle for solvency purposes);

- when the calculation of an economic value is unjustifiable and impractical in terms of the costs involved and the benefits derived.

TS.I.A.3 When participants have ring-fenced funds in place (see definition in TS.V.C), which separate part of the resources from the rest of the business, the calculation of the liabilities and assets for each ring-fenced fund should include all cash-flows in and out of that fund. For

example, inter-fund cash-flows should be considered as assets of the fund which receives them and as a liability of the fund of origin. When preparing accounts for the whole undertaking, the transactions between funds should be netted off.

TS.I.A.4 The attention of participants is drawn to the two following points:

Intangible assets (including goodwill):

TS.I.A.5 For solvency purposes, the economic value of most intangibles assets is considered to be nil or negligible, since they very rarely have a cashable value. Therefore, for the purpose of QIS4 all intangibles assets should be valued at nil.

Participants should, however, provide the following additional quantitative information:

1) The accounting value ascribed to the following four intangible asset categories:

(a) Goodwill on acquisition of participations

(b) Goodwill on acquisition of business

(c) Brand names

(d) Other intangibles assets (please specify their nature)

2) For intangible assets in a – d above that have an economic value that is cashable participants should provide the economic value of that intangible asset. In these cases participants should provide a detailed description of the valuation method and valuation assumptions used, the valuation process and the valuation governance followed and the difference (if any) with the accounting value.

Deferred taxes[1]:

TS.I.A.6 Solvency II has prudential supervision as its exclusive purpose and is therefore neutral and agnostic with regard to any issue concerning general accounting or taxation As Solvency II is not introducing any amendments in insurance accounting nor the valuation basis used for tax purposes, , the difference stemming from the prudential revaluation of technical provisions for Solvency II purposes does not correspond to a one-off profit in the accounts and therefore does not create a one-off tax liability. Thus participants should not include in their solvency balance-sheet a deferred tax liability specifically related to the change in value of technical provisions arising from the move from Solvency I to Solvency II. However, the economic approach underpinning Solvency II implies that all expected future cash-out and -in flows should be recognized in the solvency balance-sheet, including those related to taxes applicable under the fiscal regime currently in force in each country. The valuation of those deferred tax items is addressed in sections TS.III.A and TS.III.B of the QIS4 specifications.

TS.I.B. Guidance

TS.I.B.1. Where the figures used for QIS4 differ from the figures used for general purpose accounting, participants are invited to explain how those QIS 4 figures were derived, for example:

[1] For more detail on the valuation of deferred taxes relating to assets and other liabilities, participants are invited to refer to the Accounting / IFRS tables presented in TS.III.A and TS.III.B of the QIS4 specifications. Regarding the recognition of the loss-absorbing capacity of those deferred taxes in the SCR calculation, participants should refer to TS.VI.I.

- evaluated through the use of a purposefully designed system (expand on reliability and experience thereof); or

- roughly evaluated on the basis of more reliable, less economic figures (e.g. slight amortisation of a relatively recent economic valuation); or

- rough estimate.

TS.I.B.2. If applicable, participants should also indicate whether these figures were already used for another purpose in the conduct of business (i.e. other than for QIS 4).

Guidance for (i) and (ii) – marking to market and marking to model

TS.I.B.3. Where a market value is already available because it has been calculated or assessed for purposes other than accounting, it should be reported within QIS4. It is recognised that a number of balance sheet items, including most marketed investments, will have an economic value readily available through market appraisals, which may or may not be conducted for accounting purposes.

TS.I.B.4. It is understood that, when marking to market or marking to model, participants will verify market prices or model inputs for accuracy and relevance and have in place appropriate processes for collecting and treating information and for considering valuation adjustments.

TS.I.B.5. Participants are also invited to provide additional information on the following:

- the identification of those assets and liabilities which are marked to market and those which are marked to model;

- where relevant, the characteristics of the models and the nature of input used when marking to model;

- any differences between the economic values obtained and the accounting figures (in aggregate, by category of assets and liabilities);

TS.I.B.6. Participants are also invited to provide feedback on their own experience with respect to the valuation of assets and liabilities under those principles, as well as any suggestions for future work at Level 2.

Guidance for (iii) – adjustments for relevant balance sheet items under IFRS

TS.I.B.7. Considering that some undertakings in the EU already use IFRS as a basis for their financial reporting, and because IFRS is the only common European accounting standard, some tentative views on the extent to which IFRS balance sheet figures could be used as a reasonable proxy for economic valuations under Solvency II have been provided in the QIS4 specifications.

TS.I.B.8. These views are developed in the tables included in this paper (see TS.III.A and TS.III.B: Accounting / IFRS solvency adjustment for valuation of assets and other liabilities under QIS4). In these tables, we have identified the items for which IFRS valuation rules might be considered consistent with economic valuation, and for other items, adjustments to IFRS standards are proposed in order to bring the value of the item closer to an economic

valuation approach. Firms using local GAAP should attempt to apply the principles and adjustments indicated in the tables presented in TS.III.A and TS.III.B to their local GAAP standards, where feasible and appropriate.

TS.I.B.9. If, in the process of answering QIS 4, firms consider that other adjustments to their accounting figures should be provided for, they should identify and explain those adjustments.

TS.I.B.10. This analysis should not be considered as setting any interpretations of IFRS standards. Furthermore, this analysis does not pre-empt future conclusions on the possible need for solvency adjustments under IFRS. These will be drawn, amongst others, from the results of QIS4, industry comments, and further contributions from stakeholders.

TS.I.B.11. As part of QIS 4 outputs, participants should highlight any particular problematic areas regarding the application of IFRS valuation requirements for Solvency II purposes, and in particular bring to supervisors' attention any material effects on their capital figures/calculations.

Guidance for (iv) – use of accounting figures not regarded as economic values

TS.I.B.12. When accounting figures are used, which can not regarded as economic values, participants should be able to demonstrate that:

(a) the difference between the economic value and the accounting value is unlikely to be significant; and/or

(b) that the explicit calculation of an economic value entails excessive costs.

TS.I.B.13. Where relevant, participants are kindly requested to provide any useful information on the implementation of the above stated principles.

TS.II. Technical provisions

TS.II.A General Principles

TS.II.A.1. Participants should value technical provisions at the amount for which they could be transferred, or settled, between knowledgeable willing parties in an arm's length transaction.

TS.II.A.2. The calculation of technical provisions is based on their current exit value.

TS.II.A.3. The calculation of technical provisions shall make use of and be consistent with the information provided by the financial markets and generally available data on insurance technical risk.

TS.II.A.4. The technical provisions are established with respect to all obligations towards policyholders and beneficiaries of insurance contracts.

TS.II.A.5. Technical provisions should be calculated in a prudent[2], reliable and objective manner. No reduction in technical provisions should be made to take account of the creditworthiness of the undertaking itself.

TS.II.A.6. The value of the technical provisions is equal to the sum of a best estimate and a risk margin. The best estimate and the risk margin should be valued separately, with the exception of hedgeable (re)insurance obligations (see TS.II.A. 8 and 16 below).

TS.II.A.7. In order to obtain information about the difference between the value of technical provisions in accordance with QIS4 criteria and the current value of technical provisions under Solvency I, participants are requested to disclose both technical provisions figures, according to QIS4 and according to local GAAP, differentiating between LOBs and segments. Participants are also invited to comment on the main causes for those differences.

TS.II.A.8. Separate calculations of the best estimate and the risk margin are not required, where future cash-flows associated with insurance obligations can be replicated using financial instruments for which a market value is directly observable. In this case, the value of technical provisions should be determined on the basis of the market value of those financial instruments.

TS.II.A.9. In certain specific circumstances, the best estimate element of technical provisions may be negative (e.g. for some individual contracts). This is acceptable and participants should not set to zero the value of the best estimate with respect to those individual contracts.

Best estimate

TS.II.A.10. The best estimate is equal to the probability-weighted average of future cash-flows, taking account of the time value of money, using the relevant risk-free interest rate term structure.

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[2] This shall not be understood as a requirement that technical provisions should include any implicit or explicit margin above the risk margin required to bring the value of the technical provision to the current exit value.

TS.II.A.11. The calculation of best estimate should be based upon current and credible information and realistic assumptions and be performed using adequate actuarial methods and statistical techniques.

TS.II.A.12. The cash-flow projection used in the calculation of the best estimate should take into account of all the cash in- and out-flows required to settle the obligations over their lifetime.

TS.II.A.13. The best estimate should be calculated gross, without deduction of the amounts recoverable from reinsurance contracts and special purpose vehicles.

Risk Margin

TS.II.A.14. The risk margin is such as to ensure that the value of technical provisions is equivalent to the amount that (re)insurance undertakings would be expected to require to take over and meet the (re)insurance obligations.

TS.II.A.15. The risk margin should be calculated by determining the cost of providing an amount of eligible own founds equal to the Solvency Capital Requirements necessary to support the insurance (re)obligations over their lifetime.

Hedgeable and non-hedgeable (re)insurance obligations

TS.II.A.16. Note the two-step approach for “hedgeable” and “non-hedgeable” (re)insurance obligations. The first step focuses on the split of the (re)insurance obligations into “hedgeable” and “non-hedgeable”, and the second step focuses on how an explicit risk margin for non-hedgeable cash-flows is to be calculated. The valuation of the technical provisions should cover both hedgeable and non-hedgeable (re)insurance obligations.

TS.II.A.17. In line with the principle set out in TS.II.A.8, where the future cash-flows associated with (re)insurance obligations can be replicated using financial instruments, those obligations are considered as "hedgeable" and separate calculations of the best estimate and risk margin are not required. In this case participants should follow the guidance provided in paragraphs TS.II.A.22 to TS.II.A.28.

TS.II.A.18. Conversely, where (re)insurance obligations are considered as "non-hedgeable" because the future cash-flows associated with those obligations cannot be replicated using financial instruments, separate calculations of the best estimate and risk margin are required. Please note that "non-hedgeable" (re)insurance obligations are still to be valued on a market-consistent basis as set out in paragraph TS.II.A.3 above. In particular, where financial markets provide for relevant, credible and up-to-date information for valuation purposes, this should be duly taken into account.

TS.II.A.19. If within a contract an option, guarantee or other part of the contract can be completely separated and as such be perfectly hedged on a deep, liquid and transparent market the separate benefit is classified as a hedgeable component and is valued as set out in paragraphs TS.II.A.22 to TS.II.A.28.

TS.II.A.20. Where there is an unsure distinction between hedgeable and non-hedgeable cash-flows, or where market-consistent values cannot be derived, the non-hedgeable approach should be followed (separate calculations of best estimate and risk margin).

TS.II.A.21. The respective values of hedgeable and non-hedgeable (re)insurance obligations should be separately disclosed. For non-hedgeable (re)insurance obligations, the risk margin should be separately disclosed.

Hedgeable (re)insurance obligations

TS.II.A.22. Future cash flows from obligations towards policyholders and beneficiaries of insurance contracts are hedgeable if they can be replicated using financial instruments for which a market value is directly observable on a deep, liquid and transparent market.

TS.II.A.23. The financial instruments shall completely replicate all possible payments corresponding to the liability cash-flow, taking into account the uncertainty in amount and timing of these payments (theoretical perfect hedge)[3].

TS.II.A.24. A perfect hedge or replication is one that completely eliminates all risks associated with the liability. In practise perfect hedges are expected to be relatively rare. If in practice the hedge is not perfect but the remaining basis risk is immaterial, in the interest of proportionality the undertaking may consider the risks as hedgeable.

TS.II.A.25. Circumstances where cash-flows are hedgeable could include, for example, some options and guarantees embedded in life insurance contracts, some unit-linked (equity-indexed for instance) life insurance contracts, cash flows where there is no uncertainty in the amount and timing, etc.

TS.II.A.26. For a hedged portfolio or replication, the non-arbitrage principle implies that the market consistent value of the hedgeable cash-flow should be acceptably close to the market value of the relevant hedge or replicating portfolio.

TS.II.A.27. A market is defined to be deep, liquid and transparent if it meets the following requirements:

(d) market participants can rapidly execute large-volume transactions with little impact on prices;

(e) current trade and quote information is readily available to the public;

(f) the properties specified in a. and b. are expected to be permanent.

TS.II.A.28. Basis risk originates from differences between the exposure in an undertakings liabilities and the contract terms of what may be purchased from the market.

Non-hedgeable (re)insurance obligations

TS.II.A.29. Where the cash-flows associated with the (re)insurance obligations contain non-hedgeable financial (due to incomplete markets) or non-financial risks (due to options and guarantees on mortality and expenses for instance) that, when combined in a single insurance contract, cannot be hedged or replicated using instruments on a deep, liquid and transparent market, the obligations may be valued by inter/extrapolating from directly observable market

[3] Examples of hedgeable (re)insurance obligations may be unit-linked and index-linked funds, where the amount of the cash-flow is linked to the value of an index or pool of assets and there is no uncertainty as to the timing of the cash flows.

prices. Market consistent valuation techniques may be used to set the assumptions for, say, financial risks within a non-hedgeable contract and, for the remaining risks (the non-financial risks in this example), valued using best estimate assumptions. The risk margin should then be determined according to a cost-of-capital (CoC) approach. The cost of capital calculation excludes market risk as this would otherwise double-count margins which are implicitly included in market prices.

TS.II.A.30. Not all financial risks can be hedged or replicated using instruments traded on a deep, liquid and transparent market. For instance, different kinds of embedded financial options and guarantees in life insurance contracts may include risks where there is a non-traded underlying[4], or risks where the duration exceeds a reasonable extrapolation from durations traded on the financial market, or risks relating to traded financial instruments that are not available in sufficient quantities, etc. Where this is the case and if the remaining risk is considered material, alternative methods to find a "hedgeable cost" may be used to adjust market information and capture an additional market-consistent risk margin. Please see TS.II.D.60 on the calibration of stochastic models.

TS.II.A.31. Even if it would be desirable, the values of hedgeable and non-hedgeable risks might not be separable under all circumstances (for instance, because a market consistent valuation has been used).

Simplifications

TS.II.A.32. According to the proportionality principle, undertakings may use simplified methods and techniques to calculate insurance liabilities, using actuarial methods and statistical techniques that are proportionate to the nature, scale and complexity of the risks they face.

TS.II.A.33. A continuum of methods is suggested ranging from low to high complexity to determine the value of (re)insurance liabilities. In accordance with the proportionality principle, an undertaking may choose a simplified method if it is proportionate to the underlying risk.

TS.II.A.34. The use of a simplification is not directly linked to the size of the insurance or reinsurance undertaking, but to the nature, scale and complexity of the risks supported by the undertaking.

TS.II.A.35. Simplified methods may be applied in the valuation of the (re)insurance liabilities where the result so produced is not material, or not materially different from the result which would result from a more accurate valuation process.

TS.II.A.36. However participants are not required to re-calculate the value of their technical provisions using a more accurate method in order to demonstrate that the difference between the result of the simplified method and the result of a more accurate method is immaterial. It is sufficient to have reasonable assurance that the difference between those two amounts is likely to be immaterial.

TS.II.A.37. Participants may use simplified actuarial methods and statistical techniques if the criteria outlined in TS.II.A.38 are satisfied or are likely to be met. Of course, as indicated in

[4] Underlying meaning the assets which determine the payments under derivatives and other contracts with options and guarantees.

TS.II.A.36, it is not necessary to re-calculate the best estimate using a more appropriate approach in order to demonstrate that the absolute / relative quantitative criteria set out below are met. It is sufficient to meet those quantitative criteria when using the simplified method. All criteria should be applied on a best effort basis.

TS.II.A.38. Simplified actuarial methods and statistical techniques may be used if:

- the types of contracts written for each line of business or homogenous group of risk is not complex (e.g. path dependency does not have a significant effect; for example: life contract that doesn't include any options or guarantees, non-life insurance that doesn't include options for renewals);

  and

- the line of business or homogenous group of risks written is simple by nature of the risk (e.g. insured risks are stable and predictable in a sense that the amount of the claims paid could be predicted with a great certainty, or that the future claims-related cash flows can be projected with a high level of confidence). For example: term assurance, insurance of damage to land - property or motor vehicles, etc.;

  and

- any additional nature and complexity standards set out for each liability are met;

  and

- the liability that is valued is not material in absolute terms, or relative to the overall amount of the total best estimate. For the purposes of QIS4, please use the following guidance on materiality to determine when simplifications may be used for the technical provisions:

  - the result from the simplified approach (sum of all best estimates of liabilities determined with simplified actuarial methods and statistical technique) is no more than 50 million Euro for life business, and 10 million Euro for non-life business;

  or

  - the value of best estimate determined with simplified actuarial methods and statistical technique for each homogenous group of risks where simplified method is used is no more than 10% of the total gross best estimate; **and**
  - the sum of all best estimates determined with simplified actuarial methods and statistical technique is no more than 30% of the total gross best estimate.

  This guidance on materiality is applicable with respect to all simplifications to determine the value of the best estimate and/or risk margin.

TS.II.A.39. If a participant (e.g. a captive (re)insurer) does not meet the threshold indicated, but nevertheless thinks it should be allowed to apply a simplified approach because of the specificities of its situation, it can do so provided that it 1) explains the reasons for this and 2) indicates the criteria it considers relevant in its situation. The participant is also invited to

carry-out the more accurate calculation to allow CEIOPS to benchmark the simplified calculation.

All participants are invited to comment on the level of the quantitative thresholds.

TS.II.A.40. For further clarity, all simplifications have been included in boxes.

Proxies[5]

TS.II.A.41. Proxies for the valuation of technical provisions come into play where there is insufficient company-specific data of appropriate quality to apply a reliable statistical actuarial method for the determination of the best estimate. Proxies can be regarded as special types of simplified methods which are positioned at the "lower end" of continuum of methods that could be applied

TS.II.A.42. Under the future Solvency II regime, proxy methods will be needed whenever a lack of sufficiently credible own data cannot be avoided. This is the case, for example:

- for entirely new types of insurance in the market that won't have any historic data to act as a guide (e.g. cyber risks);
- for classes of business that are being written for the first time by an insurer;
- where due to legislative or significant underwriting changes the characteristics of the terms of the insurance contracts are changed in such a manner that historic data is rendered useless; or
- when the insurer (or the class of business in question) is too small to allow the build-up of credible historic claims data.

TS.II.A.43. Under the Solvency II framework, proxies can be used to determine technical provisions if:

- the proxy is compatible with the general principles underlying the valuation of technical provisions under Solvency II; and
- the use of the proxy is proportionate to the underlying risks.

TS.II.A.44. An appropriate valuation of technical provisions under the Solvency II principles (including the use of proxies) will require sufficient actuarial expertise. Consistent with this, the Framework Directive Proposal requires insurers to provide an actuarial function to ensure the appropriateness of the methodologies and underlying models used as well as the assumptions made in the calculation of technical provisions[6]. However, it should be acknowledged that currently a significant number of insurers have not yet built up their actuarial expertise to the level which will be required under Solvency II, especially in non-life insurance where in some markets the use of actuarial techniques has traditionally been less widespread than in life insurance. In the light of this, and in order to increase the participation of the insurance industry in QIS4, the QIS 4 package includes a technical tool which is

[5] For further considerations on the use of proxies under Solvency II, participants are referred to the interim report of the CEIOPS – Groupe Consultatif Coordination Group on Proxies, available under www.ceiops.eu .

[6] Cf. Article 47 of the Framework Directive Proposal.

intended to facilitate the "best estimate" valuation of technical provisions in non-life insurance.

TS.II.A.45. Section TS.IV of these specifications contains a description of a range of proxy valuation techniques for technical provisions, including criteria under which these proxies could be applied.

TS.II.A.46. When applied with sufficient actuarial expertise and professional judgement, these techniques (or parts of these techniques) can in certain circumstances be regarded as sound actuarial techniques. It should be noted, however, that over-reliance on any one proxy method would seem inappropriate, considering that each may, at a point in time, produce sensible estimates, but changing circumstances may render its accuracy and validity of limited use. Therefore, to the extent this is practicable, participants should not rely on a single proxy method, thought to be appropriate, but rather consider a range of approaches before making a final decision on which method they take.

TS.II.A.47. When using proxy techniques, participants are also requested to provide additional qualitative information. In particular, participants are invited to comment on the appropriateness and suitability of the proposed proxy techniques, including the extent to which these techniques are consistent with the overall philosophy of Solvency II. Such information will allow for the further development of proxy techniques (including technical descriptions as well as application criteria) for the valuation of technical provisions under Solvency II.

TS.II.B. Best Estimate

Overall valuation principles

TS.II.B.1. In deriving the best estimate, all potential future cash-flows that would be incurred in meeting liabilities to policyholders need to be identified and valued.

TS.II.B.2. The best estimate is equal to the expected present value of all future potential cash-flows (probability weighted average of distributional outcomes), based upon current and credible information, having due regard to all available information and reflecting the characteristics of the underlying (re)insurance portfolio. Entity-specific information should only be used in the calculation to the extent it enables participants to better reflect the characteristics of their (re)insurance portfolio (e.g. entity specific information regarding claims management and expenses).

TS.II.B.3. The best estimate should be assessed using a relevant and reliable actuarial method. Ideally, the method retained by participants should be part of actuarial best practice and should capture the technical nature of the (re)insurance liabilities most adequately. Sections TS.II.B to TS.II.E of the QIS4 technical specifications contain detailed guidance on that point. The method retained by participants should be implemented in a prudent[7], reliable and objective manner.

TS.II.B.4. The local GAAP numbers should not be used as an input for the best estimate for QIS4 purposes, unless local GAAP standards actually deliver a valuation of the technical provisions which is in line with the Solvency II valuation principles recalled in section TS.II.A (i.e.

[7] This should not be understood as a requirement that technical provisions should include any implicit or explicit margin above the risk margin to bring the value of technical provisions to the current exit value.

current exit value, market-consistency, best estimate plus explicit risk margin). In many cases, the valuation of technical provisions in accordance with Solvency II is likely to be different from local GAAP figures.

TS.II.B.5. In line with the best estimate definition, the projection horizon used in the calculation should cover the full lifetime of the (re)insurance portfolio. In practice, the projection horizon used by participants should be long enough to capture all significant cash-flows arising from the contract or groups of contracts being valued. And if the projection horizon does not extend to the term of the last policy or claim payment, participants should ensure that the use of a shorter projection horizon does not significantly affect the results.

TS.II.B.6. Insurers should describe which actuarial method they used to determine the best estimate and whether they used various actuarial methods.

Assumptions

TS.II.B.7. The realistic assumptions should neither be deliberately overstated nor deliberately understated when performing professional judgements on factors where no credible information is available.

TS.II.B.8. Cash-flow projections should reflect expected demographic, legal, medical, technological, social or economic developments. For example, a foreseeable trend in life expectancy should be taken into account.

TS.II.B.9. Appropriate assumptions for future inflation should be built into the cash-flow projections. Care should be taken to identify the type of inflation to which particular cash-flows are exposed. For some cash-flows, the link may be to consumer prices, but there are other links such as salary inflation, which tends to exceed consumer price inflation. The base underlying inflation assumptions (i.e. before allowing for specific features) used should be consistent with that implied by the market prices of relevant financial instruments (for example, inflation proofed swaps). Therefore, the inflation used in the calculations should be the market consistent base underlying inflation plus the necessary amount to reflect the specific features of the cost or cash-flows.

Discounting

TS.II.B.10.Cash-flows should be discounted at the risk-free discount rate applicable for the relevant maturity at the valuation date. These should be derived from the risk-free interest rate term structure at the valuation date. Where the financial market provides no data for a maturity, the interest rate should be interpolated or extrapolated in a suitable fashion.

TS.II.B.11.For QIS4 purposes, the prescribed risk-free interest rate term structure for the Euro has been derived from swap rates[8]. The methodology of its derivation can be found in annex TP1 "Adoption of interest rate term structure methodology". Yield curves for other EEA currencies and certain other currencies which are consistent with the methodology of the Euro curve are provided as well. Participants are expected to use a similar approach for non-specified currencies.

[8] Further work will need to be conducted to see whether swap rates are an appropriate benchmark to determine the risk-free interest rate term structure, once liquidity considerations have been taken into account.

TS.II.B.12.If for certain currencies, a swap market does not exist, the government bonds may be used to determine the risk-free interest rate term structure. To determine that alternative risk free interest rate term structure, a model which is close to the model used by the European Central Bank should be applied[9].

TS.II.B.13.In addition, a participant may deviate from the prescribed term structure and apply an interest rate term structure which was derived by the participant itself. Creditworthiness of the undertaking should not have any influence on the interest rate term structure derived by the participant. The participant is requested to disclose the term structure, as well as the reason for the deviation, and is invited to indicate the impact on the best-estimate technical provisions of the internal interest rate curve as compared to the prescribed interest rate term structure.

TS.II.B.14.The use of risk-adjusted discount rates (so-called deflators) may also be allowed for cash flows linked to financial variables, provided that the underlying estimation process leads to results equivalent to those that would be obtained if the cash flows were projected using risk neutral probabilities and discounted with the relevant risk-free interest rate term structure.

Expenses

TS.II.B.15.Expenses that will have to be incurred in the future to service an insurance contract are cash flows for which a technical provision should be calculated. For the valuation, firms should make assumptions with respect to future expenses arising from commitments made on or prior to, the valuation date.

- All future administrative costs, including investment management, commissions, claims expenses and an appropriate amount of overheads (costs not readily traceable to specific segmentation, function or process) should be considered. Expense assumptions should include an allowance for future cost increases. These should take into account the types of cost involved. The allowance for inflation should be consistent with the economic assumptions made. For disability income and other similar types of business, claims expenses may be a significant factor.

- To the extent that future deposits or renewal premiums are considered in the evaluation of best estimate, expenses relating to those future deposits and renewal premiums should usually be taken into consideration as well. Expenses related to the cash flows due to future premiums are excluded if the latter are excluded from the evaluation of the best estimate.

- Firms should consider their own analysis of expenses, future business plans and any relevant market data. But this should not include economies of scale[10] where these have not yet been realised. Professional judgement and realistic assumptions should be used to allocate any future expenses to premiums provisions or post-claims technical provisions. As an alternative to using the analysis of their own expenses and future business plans, a new company (with anticipated cost-overruns for an initial period) may consider the likely level of costs that would be incurred if the administration of existing policies were outsourced to a third party.

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[9] Cf. the website of the European Central Bank http://www.ecb.eu/stats/money/yc/html/index.en.html.

[10] Economies of scale in this context mean decreasing long-run average costs due to an expansion of the firm.

- Whenever the present value of expected future contract loadings is taken as a starting point any shortfall relative to future expenses that will have to be incurred in the future to service an insurance contract should be recognised as an additional liability (and the opposite).

Taxation payments which are charged to policyholders

TS.II.B.16.In a minority of Member States, some taxation payments are charged to the policyholder. Where this is the case, participants are required to apply the following guidance. First of all, the assessment of the expected cash flows underlying the technical provisions should include the tax liabilities assumed to be charged to the policyholder. If this is the case, the undertaking's tax liabilities should be included as "other liability" within the balance sheet. This should allow for the notional recharge of tax liabilities to policyholders.

TS.II.B.17.When valuing the best estimate, the recognition of taxation and compulsory contributions to the policyholders should be consistent with the amount and timing of the taxable profits and losses that are expected to be incurred in the future.

TS.II.B.18.In cases where changes to taxation requirements have been agreed (but not yet implemented), the pending adjustments should be reflected. In all other cases, participants should assume that the taxation system remains unaffected by the introduction of Solvency II.

TS.II.B.19.In cases where changes to taxation requirements have been agreed (but not yet implemented), the pending adjustments should be reflected. In all other cases, participants should assume that the taxation system remains unaffected by the introduction of Solvency II.

TS.II.B.20.Further work is likely to be needed to develop simplifications to calculate the allowance for deferred and future taxation within the technical provisions, as well as the adjustment for loss absorbency as a result of deferred taxes within the SCR. Where the participant has used a simplification, which assumes a change in the taxation basis, this should be highlighted and any transitional effects in taxation effects quantified separately.

Recoverables from reinsurance contracts and SPVs

TS.II.B.21.The best estimate of the (re)insurance liabilities of the participants should be calculated gross of reinsurance contracts and SPV arrangements. Therefore, the amounts recoverable from reinsurance contracts and SPVs should be shown separately, on the asset side of participants' balance sheet, as "reinsurance and SPV recoverables". The value of reinsurance recoverables should be adjusted in order to take account of expected losses due to counterparty default, whether this arises from insolvency, dispute or another reason. A similar principle applies to cash-flows from a SPV.[11]

TS.II.B.22.In certain types of reinsurance, the timing of recoveries and that of direct payments might markedly diverge, and this should be taken into account when valuing reinsurance and SPV recoverables. Recoverables should also fully take into account cedents' deposits. In particular, if the deposit exceeds the best estimate claim on the reinsurer, the recoverable is negative.

[11] In line with the general Solvency II framework, the calculation of reinsurance and SPV recoverables allows only for expected defaults. On the other, the SCR calculation includes some additional capital charge to be held for the unexpected defaults.

TS.II.B.23.The adjustment for counterparty default should be based on an assessment of the probability of default of the counterparty and average loss resulting from such a default (loss-given-default). The assessment should also take the duration of the reinsured liabilities into account.

TS.II.B.24.The assessment of the probability of default and the loss-given-default of the counterparty should be based upon current, reliable and credible information. Among the possible sources of information are: credit spreads, rating judgements, information relating to the supervisory solvency assessment, and the financial reporting of the counterparty.

TS.II.B.25.The assessment of the probability of default should implicitly take into account that the probability of default may increase under adverse scenarios. If the probability of default of the counterparty significantly depends on the amount payable to the insurance or reinsurance undertaking under the reinsurance contract or special purpose vehicles, the average probability of default should be used. The average probability should be weighted with the product of the amount payable and the probability that the amount will be payable[12].

TS.II.B.26.The assessment of the probability of default should take into account the fact that the probability increases with the time horizon of the assessment.

TS.II.B.27.If no reliable estimate of the loss-given-default is available, 50% of the value of the amounts recoverable should be used. Note that information such as credit spreads may already include an implicit allowance for the loss-given-default.

TS.II.B.28.If no reliable estimate of the probability of default is available, the probability of default of the counterparty according to the default risk sub-module of the SCR standard formula (See TS.X.A.1 - TS.X.A.11) should be used for a time horizon of one year. For a time horizon of t years, the probability $1 - (1 - PD)^t$ should be used, where PD is the probability for a time horizon of one year.

TS.II.B.29.As far as recoverables are covered by a collateral or a letter of credit, the probability of default of the collateral or the letter of credit occurring at the same time as the default of the counterparty, along with its loss-given-default may replace the probability of default and the loss-given-default of the counterparty in the calculation of the expected loss.

TS.II.B.30.The adjustment for expected loss should be calculated separately for each counterparty. However if the estimates of the probability of default and the loss-given-default of several counterparties coincide, no separate calculation is necessary under the simplified approach.

TS.II.B.31.Reinsurance recoverables – simplification

A simplified calculation of the expected loss may be made, if the following conditions are met:

[12] For instance, the counterparty must pay 100 with a probability of 99% and 10,000 with a probability of 1%. Hence, the best estimate of the amount recoverable is 199. It may be known that the counterparty will surely be able pay the amount of 100, but will surely default (with a loss-given-default of 50%) if it has to pay the amount of 10,000. Consequently, the current probability of default of the counterparty (PD) is 1%. An obvious (but wrong) calculation of the expected loss would be
199*PD*loss-given-default = 199*1%*50% ≈ 1.
But indeed, the expected loss is 99%*100*0% + 1%*10,000*50% = 50. Hence, in this case the probability of default shall rather be calculated as a weighted average of probabilities (i.e. 0% and 100%):
PD = (99%*100*0% + 1%*10,000*100%)/199 ≈ 50.25%.
Applying this probability of default, the expected loss is: 199*PD*loss-given-default ≈ 199*50.25%*50% ≈ 50.

- the expected loss according to the simplified calculation is less than 5% of the recoverables before adjustment for counterparty default; and

- the approximation is proportionate to the nature, scale and complexity of the risks supported by the undertaking, in particular there are no indications that the simplified formula significantly underestimate the expected loss

The simplified calculation shall be made as follows:

$$EL = -LGD_{\%} \cdot BE_{Rec} \cdot \max(Dur_{mod};0) \cdot \frac{PD}{1-PD},$$

where

EL is the adjustment for expected loss;

$LGD_{\%}$ is the relative loss-given-default of the counterparty, for instance 50% if no reliable estimate of the loss-given-default is available;

BE_{Rec} is the best estimate of recoverables taking not account of expected loss due to default of the counterparty.

Dur_{mod} is the modified duration of the recoverables

PD is the probability of default of the counterparty.[13]

The adjustment for expected loss shall be calculated separately for each counterparty. If the estimates of the probability of default and the loss-given-default of several counterparties coincide, no separate calculation is necessary under the simplified approach.

Future premiums from existing contracts

TS.II.B.32. The cash flows included in the best estimate of the (re)insurance liability should only include cash flows associated with the current insurance contracts and any existing ongoing obligation to service policyholders. This should not include expected future renewals that are not included within the current insurance contracts[14].

TS.II.B.33. Recurring premiums should be included in the determination of future cash flows, with an assessment of the future persistency based on actual experience and anticipated future experience.

TS.II.B.34. Where a contract includes options and guarantees that provide rights under which the policyholder can obtain a further contract on favourable terms (for example, renewal with

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[13] Under the assumption $LGD_{\%}$=100%, PD/(1-PD) is an estimate of the credit spread of the counterparty and the expected loss can be estimated applying the duration approach.

[14] Contracts with tacit renewals where the cancelation period has already expired at the reporting date (i.e. the contracts are already *de facto* renewed): even though the renewed contract may enter into force only some time after the reporting date, the renewal has actually taken place when the cancelation expired and is already effective. Therefore those already effective renewals should be duly taken into account, as opposed to future renewals.

restrictions on re-pricing or further underwriting) then these options or guarantees should be included in the valuation of the insurance liability arising under the existing contract. Where no such restrictions on re-pricing or underwriting exist, there is no ongoing obligation to service policyholders.

TS.II.B.35. In particular, future premiums should be included in the determination of future cash flows when:

(g) the payment of future premiums by the policyholder is legally enforceable;

or

(h) guaranteed amounts at settlement are fixed at subscription date.

TS.II.C Risk margin

TS.II.C.1 A cost-of-capital methodology should be used in the determination of the risk margin.

TS.II.C.2 Under the cost-of-capital approach, the risk margin is calculated by determining the cost of providing an amount of eligible own funds equal to the SCR necessary to support the insurance and/or reinsurance obligations over their lifetime. In order to do so, participants should produce a projection of their insurance and/or reinsurance obligations until their extinction and then, for each year, participants should determine the amount of the SCR to be met by an undertaking facing such obligations.

TS.II.C.3 The calculation of technical provisions is based on their current exit value which means that the cost of providing capital is assessed starting from the valuation day of the best estimate (denote it by $t = 0$).

TS.II.C.4 For the purpose of QIS4, participants are requested to perform their SCR calculations on the basis of the standard formula, when calculating the risk margin, even if it should be possible to use the output of an approved internal model to perform the SCR calculation under the future Solvency II framework.

TS.II.C.5 On an optional basis, participants which have developed a full or partial internal model are also invited to communicate the result of their risk margin calculations based on these models, provided that the results using the standard formula are also communicated.

TS.II.C.6 Where the risk margin calculation is based on the standard formula, it should be calculated net of reinsurance. In other words, a single net calculation of the risk margin should be performed, rather than two separate calculations (i.e. one for the risk margin of the technical provisions and one for the risk margin of reinsurance and SPV recoverables). Where participants calculate the risk margin using an internal model, they can either perform one single net calculation or two separate calculations.

Risks to be taken into account

TS.II.C.7 The risk modules that need to be taken into account in the cost-of-capital calculations are operational risk, underwriting risk with respect to existing business and counterparty default risk with respect to ceded reinsurance.

TS.II.C.8 It is assumed that related to the insurance and reinsurance obligations there does not arise any market risk or risk of default of the counterparties to financial derivative contracts.

TS.II.C.9 Renewals and future business should be considered only to the extent that they have been included in the current best estimate of liabilities (See TS.II.B.32 and TS.II.B.33).

Distinct calculations for each segment / line of business

TS.II.C.10 Participants are requested to differentiate calculations on different segments.

TS.II.C.11 For Life insurance, the value of the risk margin should be reported separately for each segment as defined in TS.II.D.1 - TS.II.D.5.

TS.II.C.12 For non-life insurance, the value of the risk margin should be reported separately for each line of business as defined in TS.II.E.1- TS.II.E.3.

Aggregation of Technical Provisions as calculated per segment

TS.II.C.13 To obtain the overall value of technical provisions, participants should assume that no diversification benefits arise from the grouping of technical provisions calculated per segment.

Cost-of-Capital rate

TS.II.C.14 All participants should assume that the Cost-of-Capital rate is 6%.

Steps to calculate the risk margin

TS.II.C.15 The steps to calculate the risk margin under a Cost-of-Capital methodology can be summarised as follows (it is here assumed that the valuation date is the beginning of year 0, i.e. t=0):

- For each insurance / reinsurance segment find an SCR for year t = 0 and for each future year throughout the lifetime of the obligations in that segment. SCR for year 0 corresponds to the capital requirement that the firm should hold today with the exception that only part of the risks are considered. The risks to be taken into account are operational risk, underwriting risk with respect to existing business and counterparty default risk with respect to reinsurance ceded.

- Multiply each of the future SCRs by the Cost-of-Capital rate to get the cost of holding the future SCRs.

- Discount each of the amounts calculated on the previous step using the risk free yield curve at t=0. The sum of the discounted values corresponds to the risk margin to be attached to the best estimate of the relevant liabilities at t=0.

- The total amount of risk margin is the sum of the risk margins in all the segments.

Finding the future SCRs

TS.II.C.16 The main practical difficulty of the method is deriving the SCR for future years for each segment. The calculation of the different risk charges for the future SCRs can either be done by the direct application of the SCR formulae or through simplifications. In the following paragraphs there is a list of the risks to be taken into account and a short description of possible simplifications that could be used.

TS.II.C.17 The overall SCR estimate for each segment determined by combining the corresponding charges for non-life underwriting risk, life underwriting risk, health underwriting risk, operational risk and reinsurance counterparty risk by means of the aggregation method of the SCR standard formula. If the participant is carrying out the optional calculation where a full or partial internal model is used for the estimation of SCR for each segment, the participation should rather use the aggregation method of its internal model.

Estimating operational risk

TS.II.C.18 The operational risk capital charge can always be calculated using the SCR standard formula. The formula uses as input parameters earned premiums gross of reinsurance and best estimates of technical provisions (comprising both premium provision and outstanding claims provision) gross of reinsurance. There is also an upper limit with respect to BSCR. These input data have to be estimated for each respective year in each segment. Participants are reminded that the best estimates are valued at the time value of money of the development year in question (consistent with the use of the interest rate term structure at the valuation date).

Risk Margin Simplifications (1)

TS.II.C.19 Estimating counterparty default risk

Counterparty default risk charge with respect to reinsurance ceded can be calculated directly from the definition for each segment and each year. If the exposure to the default of the reinsurers does not vary considerably throughout the development years, the risk charge can be approximated by applying reinsurers' share of best estimates to the level of risk charge that is observed in year 0.

According to the standard formula counterparty default risk for reinsurance ceded is assessed for the whole portfolio instead of separate segments. If the risk of default in a segment is deemed to be similar to the total default risk or if the default risk in a segment is of negligible importance then the risk charge can be arrived at by applying reinsurers' share of best estimates to the level of the total capital charge for reinsurers' default risk in year 0.

TS.II.C.20 Estimating non-life underwriting risk

Underwriting risk charge for non-life business (other than catastrophe risk) can be calculated directly from the formula using best estimate for outstanding claims provision net of reinsurance (other than annuities) and earned premiums net of reinsurance as input parameters. Renewals and future business are not taken into account. For simplicity it can be assumed that the undertaking-specific estimate of the standard deviation for premium risk remains unchanged throughout the years.

Underwriting risk charge for catastrophe risk (CAT) is taken into account only with respect to the insurance contracts that exist at $t = 0$. If no better estimate of the catastrophe risk charge for a segment in year y is accessible then the size of the risk charge can be assumed to be in direct proportion to the earned premiums net of reinsurance in that segment.

If it is not possible to differentiate the catastrophe risk charges in between segments then it can be assumed that the exposure is proportionate to the net earned premiums.

Usually the periods of insurance are not very long in non-life insurance so that the earned premiums differ from zero only for the first few years. This provides for a further simplification. Since there does not exist any premium or catastrophe risk for the years when earned premiums are zero the underwriting risk module for non-life consist only of the reserve risk. The risk charge for the reserve risk in a segment is simply of the form constant times the best estimate of the outstanding claims provision net of reinsurance.

TS.II.C.21 Estimating health underwriting risk

In short term health insurance, the lifetime of the obligations is short by definition. Typically the capital charge for the first 12 months will suffice ($t=0$). If there are obligations that are not negligible beyond the first year, simplifications similar to those in non-life underwriting risk can be used. For simplicity it may be assumed that the overall standard deviation σ remains the same over time.

Similarly, the underwriting risk charge for the workers' compensation general module should be calculated using the guidelines proposed for non-life underwriting risk. However, the workers' compensation annuities risk charge should be calculated using the methods proposed for the life underwriting risk charge.

TS.II.C.22 Estimating life underwriting risk

As an approximation, the future SCRs for sub-modules can be calculated using the simplified SCR approaches (See paragraphs TS.XI.B.10, TS.XI.C.9, TS.XI.D.8, TS.XI.E.10, TS.XI.F.6 and TS.XI.G.5). Future SCRs should then be calculated using inputs projected into the future required to calculate the simplified SCRs.

TS.II.C.23 Estimating the risk-absorbing effect of future profit sharing

Undertakings should project the SCR net of the risk-absorbing effect of profit sharing (see TS.VI.H) for the purpose of calculating the risk margin. Profit sharing may be ignored where this is largely a result of risks which have been excluded from the projection (e.g. market risk).

Alternatively, the effect of profit sharing can be approximated by calculating the SCR at future periods calculated gross of the profit sharing effect multiplied by the ratio of the SCR net of

profit sharing effect at t=0 (excluding market risk) divided by the SCR gross of profit sharing effect at t=0 (excluding market risk).

Risk Margin Simplifications (2)

TS.II.C.24 If participants are unable to use above simplifications, then the following can be used.

The simplified calculations shall be made per segment. They may only be applied if the standard formula is applied to calculate the SCR. For those segments which include risks calculated by the non-life, life and/or health methods below, the overall risk margin is calculated by combining the results from the simplifications by means of the aggregation method of the SCR standard formula.

TS.II.C.25 Non-life insurance

The Cost-of-Capital risk margin for a LoB is determined using the formula:

$$CoCM \approx CoC \cdot \left(\begin{array}{c} SCR_{lob}^{tf}(0) + \\ \left(Dur_{\mathrm{mod},\,lob} - 1\right) \times (3 \cdot \sigma_{(res,lob)} \cdot PCO_{lob}^{net} + 0.02 \cdot PCO_{lob}^{gross} + Def_{re,lob}) \end{array} \right)$$

Where:

CoCM is the Cost-of-Capital margin;

CoC is the Cost-of-Capital rate;

$SCR_{lob}^{tf}(0)$ is the current SCR for the line of business, excluding market risk and default risk for financial derivatives;

Dur_{mod} is the modified duration of PCO_{lob}^{net};

σ(res,lob) is the standard deviation for reserve risk of the line of business LoB, as defined in the SCR standard formula premium and reserve risk module;

PCO_{lob}^{net} is the net best estimate provision for claims outstanding in the LoB;

PCO_{lob}^{gross} is the gross best estimate provision for claims outstanding in the LoB;

$Def_{re,lob}$ is the current capital charge for reinsurance default risk assigned to the LoB.

If the portfolio of the line of business LOB contains treaties with a contract period that exceeds the following year, an amendment of the above result for the premium and catastrophe risk (CAT) risk for the time after the following year shall be made.

In order to simplify the determination of $SCR_{lob}^{tf}(0)$, the current SCR for premium and reserve risk in the line of business may be estimated as follows:

$$NL_{pr,lob} \approx 3 \cdot \sqrt{\begin{array}{l} (\sigma_{(prem,lob)} \cdot P_{lob}^{existing})^2 + (\sigma_{(res,lob)} \cdot PCO_{lob}^{net})^2 \\ + 2 \cdot \alpha \cdot \sigma_{(prem,lob)} \cdot P_{lob}^{existing} \cdot \sigma_{(res,lob)} \cdot PCO_{lob}^{net} \end{array}}$$

Where:

$\sigma_{(prem,lob)}$ is the standard deviation for premium risk of the LoB, as defined in the SCR standard formula premium and reserve risk module;

$\sigma_{(res,lob)}$ is the standard deviation for reserve risk of the LoB, as defined in the SCR standard formula premium and reserve risk module;

$P_{lob}^{existing}$ is the net earned premium in the individual LoB during the forthcoming year relating to contracts closed before the valuation date;

α = 0.5 (correlation factor between premium risk and reserve risk as specified I the premium and reserve risk sub-module).

TS.II.C.26 Life insurance

The Cost-of-Capital risk margin for a segment is determined using the formula:

$$CoCM \approx CoC \cdot Dur_{\text{mod},lob} \cdot SCR_{lob}^{tf}(0)$$

where:

CoCM is the Cost-of-Capital margin;

CoC is the Cost-of-Capital rate;

$SCR_{lob}^{tf}(0)$ is the current SCR for the segment excluding market risk and default risk for financial derivatives;

Dur_{mod} is the modified duration of the best estimate provision in the segment (net of reinsurance).

In order to determine $SCR_{lob}^{tf}(0)$, a recalculation of the life underwriting SCR restricted to the segment may be necessary. This may be simplified by redistributing the sub-risk charges (mortality, longevity etc.) for the whole portfolio to the segments proportionally to appropriate exposure measures.

The following exposure measures may be taken into consideration:

Sub-risk	exposure measure
Mortality	(capital at risk) (duration of treaties under mortality risk)

Longevity	best estimate of treaties under longevity risk
Disability	(capital at risk) (duration of treaties under disability risk)
Lapse	(best estimate of treaties under lapse risk) – (surrender values of treaties under lapse risk)
Expenses	(renewal expenses) duration
Revision	Best estimate of annuities exposed to revision risk
CAT	capital at risk of treaties under mortality and disability risk

The formula is based on the assumption that the relative loss-absorbing capacity is constant over the run-off of the portfolio. Amendments to the estimation shall be made if this assumption does not hold. For example, when the simplified calculation is applied, attention should be given to the appropriate allowance for the loss-absorbing capacity of future discretionary benefits.

TS.II.C.27 Health insurance

The Cost-of-Capital risk margin for health insurance that is practiced on a similar technical basis to that of life assurance is determined using the formula:

$$CoCM \approx CoC \cdot \sum_{t \geq 0} SCR_{lob}^{tf}(0) \frac{L(t)}{(1+r_t)^t \cdot L(0)}$$

Where:

CoCM = Cost-of-Capital margin;

CoC = Cost-of-Capital rate;

$SCR_{lob}^{tf}(0)$ = the current SCR for the line of business, excluding market risk and default risk for financial derivatives;

L(t) = expected benefits, allowing for claim inflation, paid in year t;

r_t = risk free interest rate for the maturity t.

The formula is based on the assumption that the relative loss-absorbing capacity is constant over the run-off of the portfolio. Amendments to the estimation shall be made if this assumption does not hold. For example, when the simplified calculation is applied, attention should be given to the appropriate allowance for the loss-absorbing capacity of future discretionary benefits.

The risk margin for health short term and workers compensation general modules should be calculated using the guidelines proposed for non-life underwriting risk margin.

Workers' compensation annuities risk margin should be calculated using the methods proposed for life underwriting.

TS.II.C.28 Overall SCR estimate simplification

Alternatively to the simplifications provided in previous paragraphs, companies may derive future SCR values for each segment assuming that the ratio of SCR for that segment at t=0 (incorporating only the appropriate risks) over the best estimate at t=0 (or other exposure measure deemed appropriate as a reflection of the underlying risks) is constant throughout the whole run-off period of liabilities. For example, the calculation of future SCRs for the profit sharing business may be based on a projection of guaranteed benefits if this is appropriate.

For a more accurate calculation, the approach can be applied at the sub-module level.

TS.II.D Life Technical provisions

Segmentation

TS.II.D.1 Participants should segment its portfolio into homogenous risk groups for the purposes of setting the best estimate assumptions.

TS.II.D.2 Participants should segment its portfolio into lines of business that could be transferred to a third party for the purposes of calculation of risk margin.

TS.II.D.3 Participants should segment its portfolio in the following way for reporting purposes:

First level of segmentation:

- Contracts with profit participation clauses
- Contracts where the policyholder bears the investment risk
- Other contracts without profit participation clauses
- Accepted reinsurance

For the valuation of the risk margin, each of the first level segments should be further disaggregated into risk drivers in the following way:

Second level of segmentation:

- Death protection contracts
- Survivorship protection contracts
- Contracts where the main risk driver is disability/morbidity risk
- Saving contracts, that is contracts that resemble financial products providing no or negligible insurance protection relative to the aggregated risk profile.

TS.II.D.4 The segments / lines of business described in the first and second levels of segmentation are not necessarily mutually exclusive. Business should therefore be allocated according to its predominant characteristics (e.g. the allocation of endowment policies should depend on the relative significance of the death and survivorship benefits and where endowment policies with the same sum assured on death as on survival, are managed separately, these should be classified in the 4th sub-segment as a “savings product”).

TS.II.D.5 Amounts for health contracts with features similar to life business should be disclosed separately.

Risk factors

TS.II.D.6 Relevant risk factors should include at least the following:

- Mortality rates
- Morbidity rates
- Disability rates
- Lapse rates
- Option take-up rates
- Expense assumptions

TS.II.D.7 No surrender value floor should be assumed for the amount of the market consistent value of liabilities for a contract.

TS.II.D.8 Where the cash-flow being valued contains options that may be exercised against the firm, or the potential outcomes have an asymmetrical distribution (e.g. guarantees), then the best estimate must take account of an appropriate market consistent value in respect of those options and/or asymmetries reflecting both the intrinsic and the time value.

Grouping of contracts

TS.II.D.9 As a starting point, the valuation should be based on policy-by-policy data, but reasonable actuarial methods and approximations may be used. In particular the projection of future cash-flows based on suitable specimen policies can be permitted.

TS.II.D.10 Due to the principle of proportionality the reasonable actuarial methods and approximation may be used if:

- The grouping of policies for valuing the costs of guarantees, options or smoothing, and their representation by representative policies (model points) is acceptable provided that it can be demonstrated that the grouping of policies does not materially misrepresent the underlying risk and does not significantly misstate the costs.
- The grouping of policies should not inappropriately distort the valuation of technical provision, by for example, forming groups containing life policies with guarantees that are "in the money" and life policies with guarantees that are "out of the money".
- Sufficient validation should be performed to be reasonably sure that the grouping of life policies has not resulted in the loss of any significant attributes of the portfolio being valued. Special attention should be given to the amount of guaranteed benefits and any possible restrictions (legislative or otherwise) for a firm to treat different groups of policyholders fairly (e.g. no or restricted subvention between homogeneous groups).

Policyholders' behaviour

TS.II.D.11 It is important to consider whether the presence of policyholder options could materially change the economic nature of the risks covered under the terms of the contract if exercised, i.e. where the have an option enabling this. In such circumstances, and where the effect of doing is expected to be material, cash-flow projections should take account of the proportion of policyholders that are expected to take up the option. Expectations should be founded on appropriate statistical analysis. This may depend on financial conditions at the time the option crystallises, which will affect the value of the option. Non-financial conditions should also be considered – for example, deterioration in health could be expected to have an impact on take-up rates of guaranteed insurability options.

TS.II.D.12 When credible and relevant discontinuance experience is available firms should make use of it. Where a discretionary surrender value is paid on discontinuance, the estimates should allow for the payment the insurer would reasonably make in the scenario under consideration.

TS.II.D.13 When assessing the experience of policyholders' behaviour appropriate attention should be given to the fact that the behaviour when an option is out of or barely in the money should not be considered a reliable indication of likely policyholders' behaviour when an option is significantly in the money.

TS.II.D.14 Appropriate considerations should also be given for an increasing future awareness of policy options as well as policyholders' possible reactions to a reduced solvency of a firm.

TS.II.D.15 In general, policyholders' behaviour should not be assumed to be independent of financial markets, a firm's treatment of customers or publicly available information unless proper evidence to support the assumption can be observed.

Management actions

TS.II.D.16 Future management actions may be reflected in the projected cash-flows and any items taken into account should be consistent with the firm's current principles and practices to run the business. Any assumptions used should reflect the actions that management would reasonably expect to carry out in the circumstances of each scenario, such as changes in asset allocation, changes in rates of extra benefits or product charges, or the way in which a market value adjustment is applied. Allowance should be made for the time taken to implement actions. Participants should use reasonable assumptions in incorporating management actions into projections of cash-flows such that the mitigating effects of the management actions are not overstated.

TS.II.D.17 In considering the sensibility of projected management actions, firms should consider their obligations to policyholders, whether through policy wordings, marketing literature or other statements that give rise to policyholder expectations of how management will run the business.

TS.II.D.18 The reflection of management actions in the valuation would normally require that the assumptions used, the calculations carried out, the numerical results obtained and the performed sensitivity analysis are based on objective, reasonable and verifiable bases. The applied principles and practices should normally also be maintained in time unless there is sufficient evidence about the necessity of their updating.

TS.II.D.19 Management actions should be calculated using the same methods and assumptions in a risk neutral valuation as in a real world valuation. That is to say that for a given scenario,

each valuation should have identical management actions. The risk neutral valuation and real world valuation may either use a different set of scenarios or place different weights on the same scenarios.

TS.II.D.20 As additional information, participants are requested to disclose their assumptions regarding management actions and comment on the objectivity, reasonability and verifiability of these assumptions.

Distribution of extra benefits

TS.II.D.21 When calculating technical provisions, participants should take account of all payments to policyholders and beneficiaries, including future discretionary bonuses, which they expect to make, whether or not these payments are contractually guaranteed, unless those payments fall under Article 90 of the Amended Directive Proposal (Surplus Funds).

- For the purpose of QIS4, the term "guaranteed benefits" include any benefits to which policyholders are already individually and unconditionally entitled as at the valuation date, including extra benefits from realised profits, irrespective of how the benefits are described (e.g. vested, declared or allotted).

- Discretionary benefits include all payments to policyholders and beneficiaries in addition to those guaranteed benefits. The amount of future discretionary benefits may be influenced by legal or contractual restrictions, market practice and/or management actions. In any case, all future discretionary bonuses should be accounted for in the calculation of technical provisions.

TS.II.D.22 For with-profit contracts, all participants are requested to split the amount of their best estimate into the three following items:

1) Guaranteed and allocated benefits, i.e. the sum of:

a) Allocated extra benefits which policyholders are individually and unconditionally entitled;

b) Allocated extra benefits which policyholders are collectively and unconditionally entitled; and

c) Guaranteed future benefits (e.g. linked with contractual clauses that guarantee an absolute minimum for bonus rates);

2) Other future benefits which relate to a legal or contractual obligation, i.e. the sum of:

d) Future benefits in excess of previous items that are linked with a legal obligation (e.g. firms must give to their policyholders a minimum share of their profits);

e) Future benefits in excess of previous items that are linked with a contractual obligation (e.g. firms may guarantee in their contracts a minimum share of their profits);

3) Future discretionary benefits in excess of previous items (e.g. firms must apply a certain bonus rate above legal and contractual obligations in order to stay competitive).

In addition, participants are invited to provide further details on items 1 and 2 by indicating the split of the latter into items a), b), c, d) and e).

TS.II.D.23 Any constraints arising from legal restrictions or profit-sharing clauses in policy conditions should be taken into consideration. It should be assumed that, in applying such clauses, the approach to calculating profits for profit-sharing purposes will not change from that which applies currently.

TS.II.D.24 Assumptions for distributing extra benefits should follow the general principles for management actions and a firm's principles and practices to run the business.

TS.II.D.25 Firms may take into consideration recent levels of extra benefits, especially where their policy is to smooth changes in rates of extra benefits.

TS.II.D.26 The valuation of the cost (or benefit) from smoothing should also reflect the practical intentions and restrictions of the firm when changing rates of extra benefits, including the minimum interval between changes and any publicly-disclosed or internally intended limits.

TS.II.D.27 Where firms differentiate their extra benefits between policy types or risk groups, this should be reflected in the assumptions on the level of future extra benefits.

TS.II.D.28 Where material to the results, firms should take into consideration the expected apportionment between annual and final extra benefits.

TS.II.D.29 The valuation of extra benefits should be consistent with the future return on assets assumed to back the liabilities.

TS.II.D.30 If a firm's principles and practices for distributing extra benefits are expected to lead to payments that are in excess of what can be generated from the reserve held for the policy or group of policies any such amounts should be taken into account unless otherwise stated. These amounts can be related to realised or unrealised profits and they might be subject to a different and a primary loss-absorbing nature in adverse circumstances compared to those extra benefits generated from the policy fund.

TS.II.D.31 However, cash-flows arising from realised profit reserves appearing in the balance sheet where they may be used to cover any losses which may arise and where they have not been made available for distribution to policyholders (surplus funds) should be excluded from the valuation of technical provisions. In particular this relates to certain profit sharing systems where surplus funds are established by (re)insurance companies. Surplus fund systems can be found for example in Austria, Denmark, Germany and Sweden. As a consequence, existing surplus funds which currently appear on the accounting balance sheet of those (re)insurance companies should not be regarded as technical provisions, to the extent they meet the above mentioned conditions.

TS.II.D.32 In some products the smoothing of extra benefits in time imposes a so-called "soft guarantee" that can have more or less restrictions attached to it. These should be given appropriate attention.

TS.II.D.33 In some cases, such as extra benefits, options, guarantees, the valuation of technical provision is intrinsic on the assets held by the firm. The assets assumed in such circumstances may be chosen accordingly to one or several combinations of the following principles:

- the actual assets held to back a specific liability (assuming a segmented investment portfolio);

- the assets considered most reasonable to back the specific liability and that attribute future investment returns to that fund;

- a proportion of the assets allocated in accordance with the cover of technical provisions; or

- a proportion of the assets allocated in accordance with the general investment portfolio.

TS.II.D.34 The valuation of extra benefits, including any projections or assumptions on future returns of the firm's asset portfolio, should be consistent with information provided by the financial markets and generally available data on insurance and reinsurance technical risks (market consistency). The assumptions on future asset returns underlying the valuation of extra benefits should not exceed the level given by the forward rates derived from the risk-free interest rates.

Where the extra benefits include options and guarantees dependent on the return on assets, please see the section below on the market cost of hedging the option or guarantee. In the absence of financial options or guarantees, the assumptions on future asset returns underlying the valuation of extra benefits should be consistent with the forward rates derived from the risk-free interest rates.

Unit-linked business

TS.II.D.35 The same cash-flow projection approach should be used for unit and index-linked business. Firms should also assume that unit-linked funds perform on a market-consistent basis.

All cash-flows arising from the product should be considered, including expenses, death benefits and charges receivable by the insurer. Where firms have the right to increase charges, assumptions on increased charging should be consistent with the general principles for management actions.

As a simplification, the income from the policy charges may often be expressed on a basis which can valued as a percentage of the current unit fund (valued as the current face value of the units) or series of fixed payments (which can be discounted using the forward rates derived from the risk-free interest rates). A full stochastic model is often not needed to value unit-linked business market consistently.

TS.II.D.36 Applying the outlined valuation principles also for unit and index-linked business, the technical provision could in some cases be less than the current value of the fund value reflecting the excess of future charges over expected expenses.

Additional information

TS.II.D.37 Participants are requested to supply additional information on the following, for life insurance contracts:

(a) For contracts which include the right to lapse, the aggregate value of surrenders; and

(b) the value of the technical provisions for all contracts which don't include the right to lapse.

This information should be split by class of business.

Health insurance

TS.II.D.38 The cash-flow projections for health insurance business should take account of claims inflation and premium adjustment clauses. It may be assumed that the effects of claims inflation and premium adjustment clauses cancel out each other in the cash flow projection, provided this approach undervalues neither the best estimate, nor the risk involved with the higher cash flows after claims inflation and premium adjustment.

Pure risk insurance

TS.II.D.39 Non-life insurance methodologies should be applied to pure risk insurance belonging to the insurance classes "accident" and "health". However where the characteristics of the contracts clearly require a different treatment, in line with life insurance valuation methodologies, participants should treat these contracts as life insurance.

Options and guarantees

TS.II.D.40 The costs of options and guarantees should be valued on a market consistent basis including both the intrinsic and the time value.

TS.II.D.41 Considerations regarding the effects of policyholder behaviour and other non-financial factors should also be taken into account in the valuation of options and guarantees.

TS.II.D.42 The costs of any option and guarantee may be valued by using one or more of the following four methods:

- if the risk from the option or guarantee is hedgeable, the market costs of the hedge or replicating portfolio of the option or guarantee should be used;
- a stochastic approach using for instance a market-consistent asset model (includes both closed form and stochastic simulation approaches);
- a series of deterministic projections with attributed probabilities; and
- a deterministic valuation based on expected cash flows in cases where this delivers a market-consistent valuation of the technical provision, including the cost of options and guarantees.

TS.II.D.43 Generally dynamic hedging strategies should not be assumed in the valuation of options and guarantees unless it forms an integrated part of a firm's principles and practices to run the business.

TS.II.D.44 A guarantee is defined as a benefit that is the maximum of either a quantity related in some way to the value of the underlying assets or a guaranteed amount (which may be time dependent and increasing on future valuation dates when extra benefits are added). A guarantee thus defines the possibility to receive extra benefits in excess of the guaranteed benefits. In financial terms a guarantee is linked to option valuation.

TS.II.D.45 For a with-profit life insurance contract with an investment guarantee, the intrinsic value represents the amount at which the extra benefits are "in the money" at the valuation date. The intrinsic value can be estimated by using representative deterministic assumptions of possible future financial outcome.

TS.II.D.46 The time value of the guarantee captures the potential for the cost to change in value in the future, as the guarantee moves "into" or "out of the money" (additional costs related to the variability of investment returns linked to assets actually held by the firm). Thus, under certain economic scenarios where amounts above the intrinsic value are required to meet policyholder's payments, the average additional cost of these events forms the time value of the guarantee.

Market cost of hedging the option or guarantee

TS.II.D.47 Where the option or guarantee is capable of being hedged, then the cost of the guarantee or option would be the market cost of hedging the option or guarantee.

Stochastic simulation

TS.II.D.48 The use of stochastic simulation is preferable for material groups or classes of with-profits insurance contracts unless it can be shown that more simplistic or alternative methods are both appropriate and sufficiently robust.

TS.II.D.49 For the purposes of valuing the costs of options and guarantees, a stochastic simulation approach would consist of an appropriate market-consistent asset model for projections of asset prices and returns (such as equity prices, fixed interest rate and property returns), together with a dynamic model incorporating the corresponding value of liabilities and the impact of any foreseeable actions to be taken by management. Under a stochastic simulation approach, the cost of the option or guarantee would be equal to the average of these stochastic projections.

TS.II.D.50 When performing the projections of assets and liabilities under the stochastic approach, the following aspects should be taken into account:

- The projection term should be long enough to capture all material cash flows arising from the contract or groups of contracts being valued. If the projection term does not extend to the term of the last policy, it should be verified that the shorter projection term does not significantly affect the results.

- The number of projections should be sufficient to ensure a reasonable degree of convergence in the results. The firm should test the sensitivity of the results to the number of projections.

- The assets projections should be based on assets actually held by the firm and reflect the principles and practices a firm has in place for managing the assets.

TS.II.D.51 A holistic approach to stochastic simulation is preferable, that is to value all items of costs together rather than using separate methods for different items. This approach requires the projection of all material cash flows arising under the contract or group of contracts for each stochastic projection, rather than only those arising from the guarantee or option within the contract. The advantages of this approach are that it ensures greater consistency in the valuation of different components of the contract and explicitly takes into account the underlying hedges or risk mitigation between components of the contract or group of contracts being valued.

Deterministic approach

TS.II.D.52 For the purposes of the deterministic approach, a series with an appropriate number of deterministic projections of the values of the underlying assets and the corresponding liabilities should be made. As described in TS.II.D.54, the criteria for determining whether a deterministic approach (and its calibration) is appropriate should be whether it is expected to reach the same level of confidence in the estimation as a more sophisticated method (model error).

TS.II.D.53 A range of scenarios or outcomes appropriate to both valuing the costs of the options or guarantee and the underlying asset mix, together with the associated probability of occurrence should be set. These probabilities of occurrence should be weighted towards adverse scenarios to reflect market pricing for risk. The costs of the option or guarantee should be equal to the expected cost based on a series of deterministic projections of the values of assets and corresponding liabilities. In using a series of deterministic projections, a firm should consider whether its approach provides a suitably robust estimate of the costs of the option or guarantee.

TS.II.D.54 When performing the projections of assets and liabilities under the deterministic approach, the following aspects should be taken into account:

- The projection term should be long enough to capture all material cash flows arising from the contract or group of contracts being valued. If the projection term does not extend to the term of the last contract, it should be verified that the shorter projection term does not significantly affect the results.

- The series of deterministic projections should be numerous enough to capture a wide range of possible out-comes and take into account the probability of each outcome's likelihood. The costs will be understated if only relatively benign or limited economic scenarios are considered.

- The assets projections should be based on assets actually held by the firm and reflect the principles and practices a firm has in place for managing the assets.

Other charges than expenses

TS.II.D.55 If a firm charges for instance for the cost of guarantees, options or smoothing in the determination of extra benefits, then when calculating the credit for those charges the

projected future levels of such charges should be separately assessed and be consistent with the firm's principles and practices to run the business.

TS.II.D.56 Other charges than expenses could be assessed by applying one or several of the following approaches:

- If the charges are fixed in some way (e.g. they are a fixed percentage of future regular premiums or fund value), then it may be sufficient to discount the expected future charges at the appropriate risk-free interest rate.

- If the future charges are to be reassessed periodically in the light of the future cost of guarantees, options or smoothing, possibly net of residual accrued past charges and costs, then the valuation of them should allow for future changes to the charges if appropriate and material.

- Especially if a firm can exercise discretion the reasonability of the projected charges should be considered. A firm should consider the actual costs of guarantees, options or smoothing and the firm's possible obligations to policyholders, whether through policy wordings, marketing literature or other statements that give rise to policyholder expectations of how the management will run the business.

Calibration of stochastic asset models

TS.II.D.57 If a stochastic asset model is being used, it should be calibrated to reflect the nature and term of the liabilities giving rise to significant guarantee and option costs. The option features reproduced should generally be for options where no significant credit risk is taken on.

TS.II.D.58 The stochastic asset model should also be calibrated to the current risk-free interest rate term structure.

TS.II.D.59 It should be noted that few (if any) asset models can replicate all the observable market values for a wide range of asset classes.

TS.II.D.60 Professional judgements need to be applied in order to determine suitable estimates of those parameters which cannot be implied from observable market prices (due to incomplete markets, long-term volatility etc.). In this situation it is acceptable to calibrate a model to the longest available price data, or the closest available moneyness, or the nearest available credit quality of issuer. This parameterisation of the model should then be adjusted to the term, moneyness or desired credit quality of the calibration. A range of reliable parameters which to be used in the valuation should be determined. (see guidance on implied volatility in paragraph TS.II.D.62)

TS.II.D.61 Where a firm has large cohorts of guarantees and uses stochastic or deterministic approaches, a firm should have regard to whether the cost of the guarantees determined under those approaches bears a reasonable relationship to the market cost of hedging similar guarantees (where it exists).

Implied volatility versus historical volatility

TS.II.D.62 For the valuation of technical provisions the implied volatility is the relevant volatility measure for financial instruments. Total return (as opposed to price return) financial

instruments should be used where insurers will receive the total return achieved on their underlying assets, with price return instruments being used where no income/dividend will be received on the underlying assets.

TS.II.D.63 For non-hedgeable financial risks, the valuation is commonly outside the scope of tradable financial instruments (maturities outside the range of tradable instruments, non-tradable or ill-liquid assets etc.) and therefore appropriate implied volatility assumptions cannot be derived from currently tradable instruments. In such cases the historical volatility (if available) should be used corrected with any observable differences from past historical volatilities. If no volatility data is available an asset which may share some similar characteristics with the original asset may be used, however appropriately adapted to the original asset.

Small insurers or portfolios

TS.II.D.64 For small insurers or portfolios the outlined general valuation approach is expected to be followed. However, for some factors, elements or procedures more pragmatic approaches can be accepted. The general valuation objective for small insurers or portfolios is that the valuation approach should not materially alter the overall valuation result and systematically under estimate the true liability. The valuation approach for small insurers or portfolios should therefore reflect the main characters of the underlying liability to be valued and produce reasonable proxies for best estimate values.

TS.II.D.65 It should be noted that the simplifications for small firms or portfolios are in principle equally well applicable for larger insurers and larger portfolios especially where risks are not considered to be significant following the principle of proportionality.

TS.II.D.66 Assumptions should generally reflect both past experiences and any foreseeable trend. A more pragmatic approach could be allowed, where this distinction is not explicitly made, but is nevertheless qualitative explored. Thus more approximate methods sets a reasonable best estimate where the historical experience and the trends are not separated and therefore some prudence is expected to be included in the estimate in order to cover model and parameter uncertainties. The prudence level set should however not be such that it includes prudence related to adverse deviations.

Mortality assumptions

TS.II.D.67 Concerning mortality assumptions a birth-year cohort approach does not need to be followed, even if it normally would be appropriate to do so. Moreover, any biometric risk could be considered to be independent from any other variable.

Cost of options and guarantees

TS.II.D.68 Generally, where there is considerable variation in the cost of options and guarantees relative to time and the conditions prevailing at that time, single deterministic scenarios cannot capture the best estimate costs in a reliable way. Since policyholder's option to surrender, and commonly also investment guarantees, can be seen to constitute a material part of the valuation approach and of the overall liability, they need to be explicitly modelled. However, a pragmatic approach leading to approximate closed form formulas could be adopted.

Policyholders' option to surrender

TS.II.D.69 Concerning policyholders' option to surrender, surrendering is often dependent of financial markets and firm specific information. However, for the purpose of QIS 4, it may be assumed that the process of surrendering is independent of financial markets and firm specific information. This assumption simplifies the modelling and enables the process to be modelled for instance with the use of hazard-rates. Care should be taken to define the surrender intensity in an actuarially sound manner.

Extra benefits

TS.II.D.70 The level of extra benefits should be consistent with the future return on investments assumed (these should be consistent with forward rates derived from the risk-free interest rates) and possible management actions. Even if the valuation of extra benefits would induce path-dependencies these might be disregarded or only partly addressed. Possible path-dependencies should however be qualitative assessed.

TS.II.D.71 Regarding the amount of the extra benefits which are "in the money", a historical average distribution ratio (reflecting past management actions) applied to the appropriate risk-free forward rate could be used. If extra benefits are also distributed from a guarantee related to mortality or expenses, these may be taken into account as an increment of the distribution ratio related to investment returns and hence these do not have to be stochastically modelled. If the firm aims at extra benefits in excess of those that are generated from the policy fund, these can be taken into account by an appropriate increment of the distribution ratio to reflect the amount distributed from excess assets.

Investment guarantee

TS.II.D.72 For the time value of an investment guarantee, it may be assumed that a Black-Scholes or any other market-consistent framework holds. A stochastic simulation approach may be required to accurately capture policyholder behaviour and management actions but with further assumptions, a closed form solution may be used as a simplification.

Other options and guarantees

TS.II.D.73 Other options and guarantees should also be qualitatively assessed. This includes identifying them and an assessment of key drivers (including any possible changes in value as time passes), triggering events and possible impacts on the firm. If considered material, other options and guarantees could be given a subjective *ad hoc* cost approximation given by an expected intrinsic amount increased with an amount that equals the expected probability that the option will move more "into the money" as time passes times the expected costs given that the event will occur.

Future premiums

TS.II.D.74 In general future premiums are not paid independently from the financial market or a firm's solvency position. This creates complicated path-dependent structures. It may be

assumed that future premiums are paid independently from the financial market and the firm's solvency position. Possible path-dependencies should however be qualitative assessed.

Future expenses

TS.II.D.75 In general expected future expenses should be explicitly recognised in the cash-flow projection. A pragmatic approach could be to recognize as a liability the future expense loadings expected to incur increased with possible historical deficiencies in the expense loadings.

TS.II.D.76 Best estimate simplification

Description

The following simplification is based on profit sharing life insurance Italian system[15] . It could be extended to other profit sharing systems if the profit sharing mechanism follows a similar approach. In particular, the simplification can be used for the Countries where the revaluation clauses of the sum insured are defined in the insurance contracts or in the national law. Moreover, an additional simplification is proposed, for policies where annual bonuses are determined by an insurer's decision.

Following the proportionality principle, the simplification can be used only by participants with a low risk profile. In this application, the assets portfolio shall have a small component of equity investment (that is, the simplified formula shall be limited to funds where the percentage invested in equity is lower than 20%) and shall not contain financial derivatives.

Input

The following input information is required separately for each fund and at least for different minimum guaranteed rates and for different maturities:

S_0 = the total sum insured at the valuation date

T = the average maturity of the policies

R = the technical interest rate

Δ = the minimum guaranteed spread over r

B = the participation coefficient (*)

w_E = the fraction of the fund invested in equity

(*) For policies where annual bonuses are determined by an insurer's decision the same approach could be used for deriving an assessment of Future Discretionary Benefits. In this case β could be set equal to the average participation coefficient over the last three years.

[15] Italian with profit contracts provide benefits which are explicitly linked to the return of a reference fund, in which the technical provisions must be invested. The investment fund, usually referred to as "segregated fund", is managed by the insurer under specified accounting rules; in particular assets are valued at "historical cost". Moreover the insurer can decide the assets mix of the fund. This features allow the undertakings to partially influence the amount of return over the minimum guaranteed to be attributed to policyholders. Such type of contracts as well as all contracts where the benefits are linked to the return of an investment fund are similar to a derivative contract having the investment return as the underlying. The future discretionary benefits can be interpreted as a "call option" written on the segregated fund's return.

Output

The simplification delivers the following output:

BE = best estimate of with profit contracts

FDB = value of future discretionary benefits

Calculation

In order to calculate the best estimate of the technical provisions of a profit sharing policy, let us consider a benefit Y_T to be paid at date T. The benefit will be determined as follows:

$Y_T = S_0 \prod(1+R_t)$,,

where

R_t is the revaluation rate in year t=1,2, …, T.

R_t t is a function R_t =m(I_t) of the return I_t on the investments in year t.

As a simple example: $m(I_t)=\max[(\beta I_t - r)/(1+r), \delta]$.

By this rule, the value of the minimum guaranteed benefit is:

$BE_{guaranteed} = S_0 (1+\delta)^T v_T$,

where v_T is the risk-free discount factor for maturity T.

The Intrinsic Value (IV) of Y_T is defined as: $IV = S_0 v_T \prod [1+m(f_t)]$,

where $f_t = v_t/v_{t-1} - 1$ is the forward rate for the period [t-1, t] derived from the risk-free interest rate term structure. As it is well-known, IV provides an underestimation of the best estimate BE of Y_T (the difference being the Time Value of Y_T).

Therefore, the simplification for the best estimate is equal to:

$BE \approx S_0 v_T \prod [1+m(f_t^*)]$,

where

f_t^* is a projection rate obtained by incrementing the forward rate:

$f_t^* = f_t + \Delta f_t$.

Considering that the calibration of the increment Δf_t shall take into account the nature, scale and complexity of the risks borne by insurance undertakings, f_t^* is calculated as follows:

$f_t^* = f_t + [\sigma_B (1-w_E) + \sigma_E w_E]/\sqrt{t}$,

where σ_B = 2,5% and σ_E = 15%.

The value of Future Discretionary Benefits is equal to: FDB=BE-$BE_{guaranteed}$

TS.II.E. Non-life Technical Provisions

Segmentation

TS.II.E.1 For non-life direct insurance, the amounts of technical provisions should be indicated for each of the insurance categories defined in Article 63 of the Council Directive on the Annual accounts and consolidated accounts of insurance undertakings (91/674/EEC), with a further refinement, namely:

- Accident and health – workers' compensation
- Accident and health – health insurance
- Accident and health –others not included under first two items
- Motor, third-party liability
- Motor, other classes
- Marine, aviation and transport
- Fire and other property damage
- Third-party liability
- Credit and suretyship
- Legal expenses
- Assistance
- Miscellaneous non-life insurance

TS.II.E.2 Proportional non-life reinsurance should be treated as direct insurance, i.e. it should be allocated to one of the 12 lines of business (LOBs) listed in the previous paragraph.

TS.II.E.3 Non-proportional reinsurance shall be split into:

- property business;
- casualty business; and
- marine, aviation and transport business.

If participants feel that the lines of business for reinsurance do not sufficiently recognise potential diversification they are invited to recommend greater granularity for non-proportional reinsurance.

TS.II.E.4 The principle of substance over form should be followed in determining how contracts are to be treated, whether in respect to an allocation within non-life insurance, or in respect of an allocation between life and non-life insurance.

TS.II.E.5 In practice, certain types of liabilities, although stemming from claims covered by non-life insurance contracts, may be similar in nature to liabilities commonly observed in life

insurance business[16]. These claims should be valued based on their technical nature, i.e. life insurance principles.

TS.II.E.6 For those Non-life LOB affected by this issue, participants should disclose separately the best estimate of liabilities similar in nature to 'standard' applicable Non life principles and the best estimate of liabilities where Life principles need to be used.

TS.II.E.7 Analogously, certain types of liabilities stemming from claims classified under life insurance business, may be better approximated (in terms of technical nature) by Non-life valuation principles[17]. These claims should be valued using relevant and applicable non-life insurance principles. Participants should disclose separately the best estimate of liabilities that are so valued.

Best estimate

TS.II.E.8 The valuation of the best estimate for claims outstanding provisions and for premium provisions should generally be carried out separately. However, if such a separate treatment is not practical, participants may value these provisions together.

TS.II.E.9 Participants are encouraged to perform the valuation of best estimate on the basis of homogeneous groups of risks (which may be more granular than the above segmentation), following actuarial best practice. Results should, however, be disclosed on the basis of the above segmentation. To the extent possible, insurers should describe on what basis the groupings were made.

TS.II.E.10 Participants should use statistical methods compatible with current actuarial 'best practice' and should take into account all factors that might have a material impact on the expected future claims experience. Typically, this will require the use of claims data on an occurrence/accident year basis or an underwriting year basis for the run-off triangles[18].

TS.II.E.11 Participants are requested to specify whether they use run–off triangles and, if it is the case, to describe these triangles. Where relevant, participants should also indicate the name of the actuarial method that they apply.

TS.II.E.12 Participants are also requested to explain to which claims they apply a case-by-case approach and why. Participants should provide the details of the method used in that case (e.g. whether and how case–by–case estimations are supplemented by actuarial methods).

TS.II.E.13 "Goodness-of-fit" tests should be applied to all statistical methods considered. The results from this analysis should be taken into account together with the estimate of future trends, the relevance of past data (particularly the inclusion of exceptional events) and other elements of actuarial judgment in determining the best estimate provisions. .

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[16] E.g. liabilities payable in the form of annuities, awarded due to the triggering of an event covered by a non-life insurance policy, for instance injuries or death resulting from a motor accident, an accident during working hours (covered by workers' compensation policy), etc. In addition, for the particular case of workers' compensation only, certain types of liabilities may also be classified in accordance with Life insurance principles, namely liabilities consisting of a flow of recurrent benefits and contingent on the life of the beneficiary (e.g. life assistance liabilities, as referred to in section TS.XII.D dealing with the workers' compensation SCR sub-module). Please note that these liabilities can be approximated using an annuity factor applied to an 'average' expected annual amount of benefits, even thought this annual amount will be subject to a certain degree of uncertainty.

[17] Some examples include certain riders included in Life insurance contracts that are equivalent in practice to personal accident and health insurance.

[18] An Excel support tool will be included in the IT tools accompanying the QIS4 exercise, for facilitating the application of an actuarial reserving method (chain-ladder) in case sufficiently smooth triangle data is available.

Premiums provisions (stand-ready obligation)

TS.II.E.14 Premium provisions substitute current unearned premium provisions and unexpired risk provisions. Premium provisions relate to the coverage period when the insurer provides the service of accepting and managing the risks to its policyholders. During the coverage period, the insurer is at risk of insured events occurring with varying severity[19].

TS.II.E.15 The calculation of the best estimate of the premium provision relates to all future claim payments arising from future events post the valuation date that will be insured under the insurer's existing policies that have not yet expired, administrative expenses and to all expected future premiums.

TS.II.E.16 Premium provision is determined on a prospective basis taking into account the expected cash-in and cash-out flows and time value of money. The expected cash flows should be determined by applying appropriate methodologies and underlying models and using assumptions that are deemed to be realistic for the line of business or homogenous groups of risk. Please see paragraphs TS.II.B.1 – TS.II.B.34 on the premiums to which this should be applied.

TS.II.E.17 Simplification

As a simplified approach, an "Expected Loss Based Proxy" with a combined ratio estimated from the firm's own data and other information could be used to derive a best estimate for the premium provision (cf. subsection TS.IV.F for a description of such a method).

Post-claims technical provisions (outstanding claims provisions)

TS.II.E.18 Post-claims technical provisions relate to the settlement period between claims being incurred and claims being settled. During the settlement period, the insurer is at risk due to uncertainties regarding e.g. the number of claims not yet reported (IBNR claims), the stochastic nature of claim sizes and the timing of claim payments (reflecting the claims handling processes and the potential reopening of claims) as well as uncertainties related to e.g. changes in the legal environment[20].

TS.II.E.19 For claims with low uncertainty, both in timing and amount (generally claims which are settled in a short term), either the result of their individual valuation (case by case) or the result of sound statistical methods may be assumed as reasonable proxies of their best estimate, provided the entity has checked that the alternative used has produced consistent estimates with the actual results obtained in back-testing.

TS.II.E.20 For claims with significant uncertainty, in either timing or amount (generally claims which are settled in a medium or long term), the best estimate should in principle be valued using relevant actuarial methods based on run-off triangles. To guarantee that the insurer controls both model and parameter errors, some general principles are suggested:

- The best estimate should in general be assessed using at least two different methods that could be considered reliable and relevant. Two methods are considered different when they are based both on different actuarial techniques and different sets of assumptions,

[19] CFO Forum Elaborated Principles for an IFRS Phase II Insurance Accounting Model. EP 4), page 3.
[20] CFO Forum Elaborated Principles for an IFRS Phase II Insurance Accounting Model. EP 4), page 3.

therefore cross-checking each other if there is some model or parameter error. Judgement should then be used to choose the most appropriate method. A most appropriate method is a technique which is part of best practice and which captures the nature of the liability most adequately.

- If the available data do not offer a robust behaviour to be integrated directly into run-off triangles and treated through generally accepted actuarial methods, the participant will try to adjust the historical data using objective and verifiable criteria, maintaining in any case homogeneity of different series used.

- If this adjustment were not possible or reliable, a case by case assessment is preferable to the application of too heterogeneous methods or to inconsistent sets of data.

TS.II.E.21 However, if it is considered that the claims handlers consistently under or over estimate claims, this should be reflected in the overall best estimate provision.

TS.II.E.22 A simplified approach would be to use a "case-by-case" estimation to stipulate the best estimate for claim amounts related to the reported but not settled claims (the RBNS provisions). However, the "case-by-case" estimation of RBNS provisions must be supplemented by a (simplified) method for stipulating the claim amounts related to incurred but not reported claims (IBNR claims[21]). In cases like this, a simplified method for calculating the IBNR-provisions could be given by a pre-specified percentage applied to the sum of cumulated claims payments and the RBNS-provisions or as the difference between the estimated overall claims costs (stipulated by an appropriate method) and the sum of cumulated claims payments and the RBNS-provisions. It should be noticed that with this approach the stipulation of the IBNR-provisions must be carried out per occurrence/ accident year (or underwriting year).

TS.II.E.23 A simplified method for calculating the IBNR claims could be based on the total of paid claims and the RBNS-amount (e.g. as a given percentage of this total) or on an estimate of the total claims costs (e.g. as a residual given by the difference between the estimated overall claims cost and the total of paid claims and the RBNS-amount).

[21] Cf. the description of a 'Case-by-case Proxy" for claims provisions in in TS.IV.

Proxies

TS.II.E.24 The following table gives an overview of the proxies that may be used by participants in order to assess non life claim provisions and premium provisions for the best estimate:

Proxy \ Applied to	Claims provision	Premium provision
Market development patterns	√	
Average severity/frequency	√	
Bornhuetter-Ferguson	√	
Case by case	√	
Expected loss		√
Simplified application of standard statistical techniques	√	
Premium based		√
Claims handling costs	√	

TS.II.E.25 These proxies are often combined (see following table) with either:

- Discounting proxies: These transform an estimate of the undiscounted expected value of future cash flows into a discounted estimate;

or

- Gross-to-Net Proxies: These transform a gross of reinsurance estimate into a net estimate.

Proxy \ Additional proxy needed	Discounting	Gross to net
Market development patterns		√
Average severity/frequency	√	√
Bornhuetter-Ferguson		√
Case by case	√	√
Expected loss		√
Simplified application of standard statistical techniques		√
Premium based		
Claims handling costs		

TS.II.E.26 Following the 'substance over form' principle, annuities arising from non-life insurance contracts are to be treated as life-insurance obligations for solvency valuation

purposes. However, the “annuity proxy” described in TS.IV.L may be used provided the related conditions are met.

TS.III. Annex 1: IFRS - Accounting / Solvency adjustments for the valuation of assets and other liabilities under QIS 4

TS.III.A. Assets

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
INTANGIBLE ASSETS				
Goodwill on acquisitions	IFRS 3.51 IFRS 4.31-32 Insurance DP Phase II (167)	IFRS 3.51 Goodwill acquired in a business combination IFRS 4.31,32 Expanded presentation for insurance contract acquired in a business combination or transfer (tentative decision in the DP)	IFRS 3.51 Goodwill is recognised by the acquirer as an asset from the acquisition date, initially measured as the excess of the cost of the business combination over the acquirer's interest in the net fair value of the acquiree's identifiable assets, liabilities and contingent liabilities. After recognition: at cost less any impairment loss (54) If the acquirer's interest exceeds the cost of the business combination, the acquirer shall reassess identification and measurement done and recognise immediately in profit or loss any excess remaining after that	Goodwill should be valued at nil for solvency purposes. Nevertheless, in order to quantify the issue, participants are requested, for information only, to provide, when possible, the treatment under IFRS 3 and IFRS 4 (that is considered an acceptable proxy for valuation on an economic value basis).

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
			reassessment (56) IFRS 4.31-32/ DP (167) Intangible assets representing the difference between the fair value of the liability (insurance rights acquired and insurance obligations assumed) and the value of the liability according to insurer's accounting policy. Subsequent measurement consistent with measurement of the related insurance liability. For contracts acquired in portfolio transfer, the Board's preliminary view is that the difference between the exit value and the consideration received should be recognised as income or expense (DP 172)	
Intangible assets		IAS 38.8,10-17 An intangible asset can be identified only if it is either:	Initially at cost (paras. 24-64) Subsequent measurement either: – cost model (74) i.e. cost less any	Intangible assets should be valued at nil for solvency purposes. Nevertheless, in order to quantify the issue, participants are requested, for information only, to

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
		– capable of being separated from the entity; or – arises from contractual or other legal rights. Recognised if, and only if: (a) it is probable that the expected future economic benefits will flow to the entity; and (b) the cost of the asset can be measured reliably. Cannot be fair valued if: (a) it is not separable; or (b) it is separable, but there is no history or evidence of exchange transactions for the same or similar assets, and otherwise estimating fair value would be dependent on immeasurable variables.	accumulated amortisation and any accumulated impairment losses – revaluation model (75) i.e. fair value less any amortisation and impairment	provide, when possible, the treatment under IAS 38, to the extent that the revaluation option and not the cost model is used (such a treatment is considered an acceptable proxy for valuation on an economic value basis).

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
TANGIBLE ASSETS				
Property, plant and equipment	IAS 16	Tangible items that: (a) are held for use in the production or supply of goods or services; and (b) are expected to be used during more than one period. Recognised if, and only if: (a) it is probable that future economic benefits associated with the item will flow to the entity; and (b) the cost of the item can be measured reliably (IAS 16.6,7,37)	IAS 16.15. Initially at cost IAS 16.29,30,31 – Subsequent measurement either: - cost model: cost less any depreciation and impairment loss; - revaluation model: fair value at date of revaluation less any depreciation or impairment	The treatment under the IAS 16 revaluation model is considered an acceptable proxy for valuation on an economic value basis if the valuation available is recent. If the value available is not recent and differs materially from that which would be determined using fair value at the balance sheet date, an economic value should be determined. If a different valuation basis is used, full explanation must be provided.
Inventories	IAS2	Assets that are: (a) held for sale in the	IAS 2.9. At the lower of cost and net realisable value.	The treatment under IAS 2, to the extent that the net realizable value and not cost is used, is considered an acceptable proxy for valuation on an economic value

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
		ordinary course of business; (b) in the process of production for such sale; or (c) in the form of materials or supplies to be consumed in the production process or in the rendering of services. (IAS 2.6)		basis. If a different valuation basis is used, full explanation must be provided.
Finance Leases (lessees)	IAS 17	IAS 17.4,8 Classification of leases is based on the extent to which risks and rewards incidental to ownership of a leased asset lie with the lessor or the lessee.	IAS 17.20 Initially at the lower of fair value or the present value of the minimum lease payment.	The treatment under IAS 17, to the extent that fair value and not the present value of the minimum lease payment is used, is considered an acceptable proxy for valuation on an economic value basis. If a different valuation basis is used, full explanation must be provided.
INVESTMENTS				
Investment Property	IAS 40-Investment Property	IAS 40.5 Property held to earn rentals or for capital appreciation or both.	IAS 40.20 Initially at cost; then either fair value model or cost model (30).	The treatment under IAS 40, to the extent that fair value is used and not a cost model, is considered an acceptable proxy for valuation on an economic value basis. If a different valuation basis is used, full explanation must be provided.

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
Participants in subsidiaries, associates and joint ventures	IAS 27 and IAS 28	Definitions in IAS 27, IAS 28 and IAS 31	IAS 27, IAS 28 IAS 31. In the separate accounts of the holding company, investments in subsidiaries, associates and JVs can be accounted for either: - at cost, or; - in accordance with IAS 39. IAS 28 (if IAS 27 is not applied to an investment in an associate): application of the equity method.	Where a fair value treatment under IAS 39 is applied, this is considered an acceptable proxy for valuation on an economic value basis[22].
Held-to-maturity investments	IAS 39	SEE IAS 39, paragraph 9	Amortised cost	These assets should be revalued to fair value in accordance with the guidance provided in IAS 39. If a different valuation basis is used, full explanation must be provided.
Loans and receivables	IAS 39	SEE IAS 39, paragraph 9	Amortised cost	These assets should be revalued to fair value in accordance with the guidance provided in IAS 39. If a different valuation basis is used, full explanation must be provided.

[22] Please note that for the purpose of calculating the solo SCR of a parent (re)insurance company, a specific valuation is taken into account, where participants apply the optional "look-through" approach set out in annex SCR 1 – TS.XVII.C.

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
Available-for-sale financial assets	IAS 39	SEE IAS 39, paragraph 9	Fair value with valuation adjustment trough equity	The treatment under IAS 39 is considered an acceptable proxy for valuation on an economic value basis. If a different valuation basis is used, full explanation must be provided.
Financial assets at fair value through profit or loss	IAS 39	SEE IAS 39, paragraph 9	Fair value with valuation adjustment through profit and loss account	The treatment under IAS 39 is considered an acceptable proxy for valuation on an economic value basis. If a different valuation basis is used, full explanation must be provided.
OTHER ASSETS				
Non-current assets held for sale or discontinued operations	IRFS	IFRS 5.6 Assets whose carrying amount will be recovered principally through a sale transaction	IFRS 5.15 Lower of carrying amount and fair value less costs to sell	The treatment under IFRS 5, to the extent that fair value and not the carrying amount is used, is considered an acceptable proxy for valuation on an economic value basis. If a different valuation basis is used, full explanation must be provided.
Deferred tax assets	IAS 12	Income taxes include all domestic and foreign taxes based on taxable profits and withholding taxes payable by a group entity	A deferred tax asset of unused tax losses/credits can be recognized to the extent it is probable that future taxable profit will be available for offset. Deferred tax assets cannot be discounted and are measured at the tax rates expected to apply when the asset is realized.	The treatment under IAS 12 is an acceptable proxy for valuation on an economic value basis. Participants are not required to include in their solvency balance-sheet a deferred tax item specifically related to the change in value of technical provisions arising from the move from Solvency I to Solvency II. However, in line with the economic approach underpinning Solvency II, all expected future cash-out and -in flows related to taxes applicable under the fiscal regime currently in force in each country should be

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
			Deferred tax assets must be reviewed at each B/S date.	recognized in the solvency balance-sheet. In particular, to the extent that a deferred tax item currently appears on the accounting balance-sheet in relation to technical provisions, this should be included in the QIS4 balance sheet.
Current tax assets	IAS 12	Income taxes include all domestic and foreign taxes based on taxable profits and withholding taxes payable by a group entity	Current tax assets are measured at the amount expected to be recovered.	The treatment under IAS 12 is considered an acceptable proxy for valuation on an economic value basis. If a different valuation basis is used, full explanation must be provided.
Cash and cash equivalents	IAS 7.6 IAS 39	Cash comprises cash on hand and demand deposits	Not less than the amount payable on demand, discounted from the first date that the amount could be required to be paid.	The treatment under IAS 7 and IAS 39 is considered an acceptable proxy for valuation on an economic value basis. If a different valuation basis is used, full explanation must be given.
IMPAIREMENT	IAS 36 IAS 39	Impairment of assets		IAS 36 and IAS 39 to be applied where relevant.

TS.III.B. Other liabilities

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
PROVISIONS	IAS 37	A provision is a liability of uncertain timing or amount. A provision should be recognized when, and only when: (a) an entity has a present obligation (legal or constructive) as a result of a past event; (b) it is probable (ie more likely than not) that an outflow of resources will be required to settle the obligation; and (c) a reliable estimate can be made of the amount of the	The amount recognized is the best estimate of the expenditure required to settle the present obligation at the balance sheet date. The best estimate is the amount an entity would rationally pay to settle the obligation or to transfer it to a third party at the balance sheet date.	The treatment under IAS 37 is considered an acceptable proxy for valuation on an economic value basis. If a different valuation basis is used, full explanation must be provided.

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
		obligation.		
FIANANCIAL LIABILITIES				
Financial Liabilities at fair value through profit or loss	IAS 39	Only recognized when an entity becomes a party to the contractual provisions of the instrument.	Fair value with valuation adjustments through profit and loss account.	The treatment under IAS 39 is considered an acceptable proxy for valuation on an economic value basis. If a different valuation basis is used, full explanation must be provided.
Other financial liabilities and amounts payable		Only recognized when an entity becomes a party to the contractual provisions of the instrument.	On initial recognition, financial liabilities are measured at fair value plus, for financial liabilities not at fair value through profit or loss, directly attributable transaction costs. After initial recognition, measured at amortized cost using the effective interest method, except for: (a) financial liabilities at fair value through profit or loss; (b) financial liabilities that arise when a transfer of a financial asset does not qualify for derecognition; (c) financial guarantee contracts - measured at the higher of:	All financial liabilities should be valued at fair value in accordance with the guidance provided in IAS 39 with no adjustment, where applicable, for own credit standing. If a different valuation basis is used, full explanation must be provided.

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
			(i) the amount determined in accordance with IAS 37; and (ii) the amount initially recognized less, when appropriate, cumulative amortization. (d) commitments to provide a loan at a below-market interest rate - measured at the higher of: (i) the amount determined in accordance with IAS 37; and (ii) the amount initially recognized less any cumulative amortization.	
OTHER LIABILITIES				
Deferred tax liabilities	IAS 12	Income taxes include all domestic and foreign taxes based on taxable profits and withholding taxes payable by a group entity.	Deferred tax liabilities cannot be discounted and are measured at the tax rates expected to apply when the liability is settled. Deferred tax liabilities must be reviewed at each B/S date	The treatment under IAS 12 is an acceptable proxy for valuation on an economic value basis. Participants are not required to include in their solvency balance-sheet a deferred tax item specifically related to the change in value of technical provisions arising from the move from Solvency I to Solvency II. However, in line with the economic approach underpinning Solvency II, all expected future cash-out and -in flows related to taxes applicable under the fiscal regime currently in force in each country should be recognized in the solvency

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
				balance-sheet. In particular, to the extent that a deferred tax item currently appears on the accounting balance-sheet in relation to technical provisions, this should be included in the QIS4 balance sheet.
Current tax liabilities	IAS 12	Income taxes include all domestic and foreign taxes based on taxable profits and withholding taxes payable by a group entity.	Unpaid tax for current and prior periods is recognised as a liability. Current tax liabilities are measured at the amount expected to be paid.	The treatment under IAS 12 is considered an acceptable proxy for valuation on an economic value basis. If a different valuation basis is used, full explanation must be provided.
EMPLOYEE BENEFITS				
Short-term employee benefits	IAS 19	Employee benefits falling due within 12 months after the period in which employee services were rendered.	Recognise undiscounted amount expected to be paid as a liability (accrued expense), after deducting any amount already paid.	The treatment under IAS 19 is considered an acceptable proxy for valuation on an economic value basis. If a different valuation basis is used, full explanation must be provided.
Post employment benefits (incl.	IAS 19	Employee benefits other than termination benefits payable after	(i) Defined contribution plan:	The treatment under IAS 19 is considered an acceptable proxy for valuation on an economic value basis. If a different valuation basis is used, full

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
pension commitments)[23]		completion of employment. Post-employment benefit plans are classified as either defined contribution plans or *defined benefit plans.*	Recognize the contribution payable: (a) as a liability (accrued expense), after deducting any contribution already paid. If the contribution already paid exceeds the contribution due for service before the balance sheet date, that excess should be recognized as an asset (prepaid expense) to the extent that the prepayment will lead to a reduction in future payments or a cash refund; and (b) as an expense, unless another Standard requires or permits the inclusion of the contribution in the cost of an asset. (ii) Accounting for defined benefit plans involves: (a) making a reliable actuarial estimate of the benefit employees have earned in current and prior periods.	explanation must be provided. Firms are also encouraged to provide feedback on whether they consider IAS 19 to be a good proxy for valuation of pension liabilities (or assets) on an economic value basis and to suggest ways in which an economic valuation might be more properly achieved.

[23] Please note that such pension commitments should be excluded from the "Net Asset Value" when performing the SCR calculation in accordance with sections 3 and 4 of the QIS4 specifications (TS.VI to TS.XIV).

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
			(b) discounting that benefit using the Projected Unit Credit Method to determine the PV of the defined benefit obligation and the current service cost. (c) determining the fair value of any plan assets. (d) determining the total amount of actuarial gains and losses to be recognized.	
Other long term employee benefits	IAS 19	Other employee benefits not falling due within 12 months after the end of the period in which employee services were rendered.	Simpler method of accounting - actuarial gains and losses and past service costs are recognized immediately.	The treatment under IAS 19 is considered an acceptable proxy for valuation on an economic value basis. If a different valuation basis is used, full explanation must be provided.
Termination benefits	IAS 19	Benefits payable as a result of either: (a) an entity's decision to terminate an employee's employment or	Recognise termination benefits as a liability and an expense only when, demonstrably committed to either: (a) terminate employment; or (b) provide termination benefits. Discount termination benefits falling due more than 12 months after the balance sheet date.	The treatment under IAS 19 is considered an acceptable proxy for valuation on an economic value basis. If a different valuation basis is used, full explanation must be provided.

Balance sheet item	Applicable IFRS	Current approach under IFRS/Insurance Contracts DP		Recommended treatment and solvency adjustment for QIS 4
		Definition	Treatment	
		(b) an employee's decision to accept voluntary redundancy	For voluntary redundancy, measurement of termination benefits is based on number of employees expected to accept offer.	

TS.IV. Annex 2: Proxies

TS.IV.A. Range of techniques

This section gives a range of techniques for the best estimate valuation of technical provisions. These techniques are defined as proxy methods in the context of QIS4, where proxies could be applied in circumstance where there is insufficient company specific-data of appropriate quality to apply a reliable statistical actuarial method for the determination of the best estimate.

TS.IV.A.1 Proxies for the best estimate of claims or premium provisions can be classified into:

- Development patterns proxies: Benchmark proxies using information of market or other reference portfolios representing characteristics similar to the own portfolio of the company in order to approximate the development of own claims over the development years.

- Frequency-severity proxies: Benchmark proxies using information of market or other appropriate portfolios by separate approximations of the development of the severity of claims and of the frequency of claims.

- Other benchmark proxies: These proxies use some information from benchmark portfolios, other own (similar) portfolios, or market-representative portfolios. They are normally used within actuarial methods in order to complete these approaches.

- Case-by-Case proxies: these are proxies based on case estimate information, in some cases adjusted for further effects, e.g. discounting or IBNR claims.

- Expected Loss proxies: these use expected ultimate loss ratios to set provisions, e.g. based on initial pricing or business plan assumptions about likely level of claims experience.

- Scaling-to-completion proxies: these proxies attempt to estimate the best estimate of the whole portfolio by 'scaling to completion' the estimate for the modelled part.

- Simplified application of standard statistical techniques: this refers to an application of statistical reserving methods (e.g. chain ladder) without carrying out full actuarial 'checks and balances' analysis.

- Premium based proxies: proxies based on local accounting figures, e.g. unearned premium reserves.

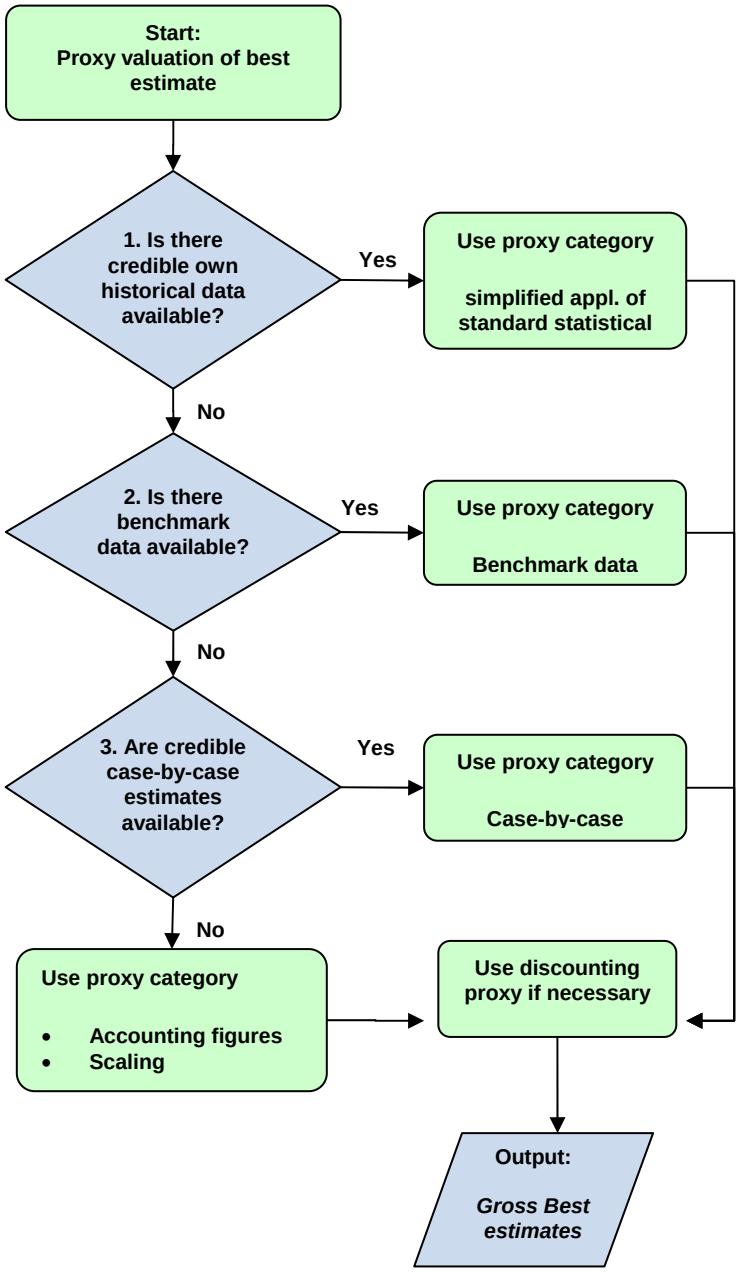
TS.IV.A.2 These proxies are often combined with either:

- Discounting proxies: These transform an estimate of the undiscounted expected value of future cash flows into a discounted estimate; or

- Gross-to-Net proxies: These transform a gross of reinsurance estimate into a net estimate.

TS.IV.A.3 The following proxy decision tree illustrates how these different classes of proxies would typically relate to another within a best estimate valuation of gross (non-life) technical

provisions. It is to be used when the participant needs to carry out a proxy valuation, i.e. when the participant has only insufficient credible historical data.



Non- life proxies

TS.IV.B. Market-development-pattern proxy

TS.IV.B.1 Description

This proxy applies a market benchmark development pattern to the development methods on paid claims to estimate the discounted best estimate of claims provisions when the insurer has only insufficient credible own data to derive frequencies and average claims specific for its own portfolio.

Let variables $A_{i,j}$ and f_j be defined as follows:

$A_{i,j}$ is the gross cumulative amount of claims paid for the accident year i, $0 \le i \le n$-1, and development year j, $0 \le j \le n$-1; n denotes the last development year, when full run-off is achieved. The last year m of observed development is usually smaller than n.

f_j is the gross development factor that reflects the "average" evolution of the $A_{i,j}$ between development years j and j+1 (for $0 \le j \le n$-1).

In this setting, the proxy consists of identifying the "market" parameters f_j for each development year j. The proxy will enable the insurer to estimate the total claims amount per accident year ($A_{i,n}$) by projecting the observed amount of claims paid in the development year zero[24] ($A_{i,0}$, known at the valuation date. More generally the projection may start from latest development year n-i with $A_{i,n-i}$). The proxy also allows the decomposition of the total claims cost into the claims costs per each of the future development years, which makes it possible to also measure the discount effect.

Usually, the available information only allows reliable estimates of development factors until a particular development year m, with m<n. In this case, the factors f_m, f_{m+2}, ..., f_{n-1} represent tail factors that are intended to explain the evolution of claims paid between years m and n (full run-off). Particularly for long-tailed LoBs, non-consideration of tail factors can lead to significant underestimation of the provision.

To estimate the "market" tail factors, statistical projection techniques may be used which extrapolate the curve from m to n: e.g. exponential decay, inverse power, logarithmic curve and other techniques.

However, it should be noted that this is a pragmatic approach that may or may not be suitable, depending on the LOB. One should note that late claims are usually more complex and have different characteristics from the most "common" claims, so by extrapolating the development pattern to later development years, the occurrence of late (and potentially large) claims may be underestimated. Therefore, the use of expert opinion is very important for estimating the tail factors.

Where a curve fitting approach has been used to derive a "full" market development pattern (including tail factors), an insurer applying this proxy should check the results of this approach with own benchmarks, for example the amount of outstanding case reserves for "old" accident years. Alternatively, it would be possible to restrict the application of this proxy to the observable part of the market development years, and to leave the determination of appropriate tail factors to the insurer.

TS.IV.B.2 Input

[24] Or more generally from the projection of the observed amount of claims paid (cumulative) for development years between zero and n, using, in this particular case, the relevant development factors reflecting the evolution from that development year to the full run-off situation (n).

The proxy requires the following input information:

- Market benchmark development factors for a given LOB and per member state;
- Market tail factors (where the consideration of tail factors is necessary to avoid an underestimation of the provision); and
- accumulated gross paid claims $A_{i,j}$ for individual accident years i and development years j.

For QIS 4, it is understood that supervisory authorities from Belgium, Italy, Germany, Sweden and Portugal will provide such market benchmark patterns for their markets and selected LOBs, in their national guidance.

In markets where development patterns have not been provided, the supervisor may decide whether participants would be allowed to use benchmark development patterns from other markets. Further analysis is required to decide whether for certain LOBs the development patterns per Member State are similar enough to "aggregate" them across Member States to one single pattern for each LOB.

TS.IV.B.3 Output

The proxy delivers the following output information:

- Expected future cash flows by maturity date; and
- Gross discounted best estimate of claims provisions.

TS.IV.B.4 Calculation

The total undiscounted ultimate cost for each accident year is given by the formula:

$$A_{i,n} = A_{i,n-1-i} \prod_{k=0}^{i} f_{n-1-i+k} \qquad i = 0,...,n-1$$

Here, $A_{i,n-i}$ denotes the last observed cumulative paid loss of accident year i at the valuation date.

The total undiscounted best estimate of technical provisions is obtained as:

$$BE^{und} = \sum_{i=0}^{n-1} \left(A_{i,n} - A_{i,n-1-i} \right)$$

The total liabilities expected to be paid at the maturity j can be obtained as:

$$Y_j = \sum_{i=j-1}^{n-1} \left(A_{i,n-1+j-i} - A_{i,n-2+j-i} \right) \qquad j = 1, 2...,n$$

The total discounted best estimate of technical provision is given by the formula:

$$BE = \sum_{j=1}^{n} Y_j \left(1 + r_j\right)^{-j}$$

Here, r_j denotes the risk-free interest rate applicable to the maturity j.

TS.IV.B.5 Criteria for application

An insurer may apply this proxy for a particular LOB if:

- the insurer has no credible own data available; or
- credible own data per year of occurrence is available, but too short; in this case the market pattern should only be used to complete cash flows for not observed parts

and in addition:

- the claims portfolio of the company is considered to be comparable to the reference portfolio, i.e. the company is not a "niche" player in the given LOB;
- a projection methodology of the "link ratio" family is generally adequate for the run-off claims paid triangles for that LoB, i.e. triangles are usually fairly stable, and it is reasonable to expect some proportionally between columns.

TS.IV.B.6 Other remarks

The discounting formula above is based on the assumption that the cash flows Y_i are paid at year-end. However, it could easily be modified to reflect other assumptions on the timing of these cash flows (e.g. that claims are paid on average in the middle of the year).

This proxies might be especially relevant for the following classes of non-life insurance:

- Accident
- Health
- Land vehicles
- Ships
- Goods in transit
- Fire and natural forces
- Other damage to property
- Motor vehicle liability
- General liability

However, further analysis is required to assess in which markets and LOB market development patterns could reliably be derived.

TS.IV.C. Frequency-severity proxy

TS.IV.C.1 Description

Frequency-severity methods derive a best estimate for claims provisions by separately estimating claims frequencies and claims severities. The proxy considered in this subsection consists of applying market data to frequency-severity reserving methods (for one or both of these variables) when the insurer has only insufficient credible own data to derive frequencies and average claims specific for its own portfolio.

The calculation is carried out separately for each accident year.

TS.IV.C.2 Input

The proxy requires the following input information for each accident year (in the given individual LOB):

- the accumulated claims payments;
- the expected (ultimate) number of claims (company-specific);
- the expected average cost (severity) of claims (based on market data).

In QIS 4, the expected severity of claims would need to be supplied by the supervisor (as an absolute quantity per LOB).

If a reliable development pattern for the number of reported claims can be calibrated from market data, a variant of this proxy could be implemented as follows:

- The market development pattern for the number of reported claims would be provided by the supervisor;
- The insurer could determine its (ultimate) number of claims by combining the percentage of claims not yet reported (inferred from the market development pattern) with the number of claims reported up to date;
- For the determination of the average severity of claims, the insurer could also use a company-specific estimate, in case this would be more reliable than the market estimate of average claims costs. The supervisor may also decide to omit an estimation of market average costs altogether, in case such estimation would not seem feasible or appropriate.

TS.IV.C.3 Output

Undiscounted gross best estimate of claims provision.

TS.IVC.4 Calculation

Under this proxy, an estimate of the ultimate claims amount is derived as:

$$U_i = N_i \bullet S_i$$

Where:

U_i = Ultimate claims amount in accident year i

N_i = expected (ultimate) number of claims in accident year i

S_i = expected average cost (severity) of claims for the applicable accident year

The best estimate for accident year i is then determined as:

$$BE_i = U_i - AC_i$$

Where:

BE_i = undiscounted best estimate for accident year i (gross of reinsurance)

AC_i = accumulated claims payments in accident year i

TS.IV.C.5 Criteria for application

To apply this proxy, the following conditions should be met:

- the overall severity of claims for the LOB can be reasonably approximated by an 'average cost', i.e. the amount of claims is, in average, relatively stable;
- the development of claim counts in the given LOB is stable.

TS.IV.C.6 Other remarks

Using average claims amounts involves a counting of the number of claims. However there are some potential pitfalls in this counting:

- Is the number of claims defined to include nil-claims?
- Does one use the number of claims reported during a year (as an approximation of the number of incurred claims) or the (estimated) ultimate number of incurred claims?
- Do all companies count the numbers in the same way? - one claim in one company may correspond to two or more claims in another company. Some examples: a fire which causes business interruption in Commercial; building and content may be affected by the same claim (fire, water damage, theft) in Private Property / Homeowner's and Householder's Comprehensive; a claim in Motor Third Party with property damage and two injured persons may be counted as 1, 2 or 3 claims.

Therefore, clear guidelines for the counting of claims are necessary to get a consistent reporting and useful averages.

TS.IV.D. Bornhuetter-Ferguson-based proxy

TS.IV.D.1 Description

The Bornhuetter Ferguson loss reserving method consists of selecting a development pattern and, for each accident year, an initial ultimate loss ratio. From these, the reserve estimate is derived.

It proves to be an interesting option to model most recent exercises insufficiently developed.

This method is less sensitive to the first years' claims payments than the chain-ladder method. As the undertaking's experience develops, the initial expected loss ratio weights less and the experience weights more in the reserve estimate.

The proxy considered in this subsection of applying market data to the Bornhuetter-Ferguson method when the insurer has only insufficient credible own data to derive initial ultimate loss ratios and development patters specific for its own portfolio.

TS.IV.D.2 Input

The following input information is required for each accident year:

- an initial market-based ultimate loss ratio + effectively paid claims
- A development pattern (entity specific if available, marked based otherwise)

TS.IV.D.3 Output

Best estimate of the claims provision.

TS.IV.D.4 Calculation

An estimate L of the ultimate claim amount is given by:

$$L = D \bullet \frac{1}{CDF} + A \bullet \left(1 - \frac{1}{CDF}\right)$$

Where:

D	=	loss development estimate
A	=	initial expected loss estimate (along initial ultimate loss ratio)
CDF	=	Cumulative loss development factor (ratio of ultimate loss estimate on basis of development pattern relative to current loss)

The best estimate is then determined as:

$$BE = L - AC$$

Where:

BE = best estimate of claims provision

AC = Accumulated paid claims

TS.IV.D.5 Criteria for application

Claim settlement practises must not vary too much over time.

TS.IV.D.6 Other remarks

Generally, the development pattern used for this approach could be based on either paid or incurred claims. In case it is based on incurred claims (i.e. cumulated paid claims plus case reserves), we have that

$$D \bullet \frac{1}{CDF} = AC + R^{case}$$

where R^{case} denotes the sum of case reserves. In this case, an estimate of the IBNR claims is given by:

$$A \bullet \left(1 - \frac{1}{CDF}\right)$$

and the best estimate derived above is given by:

$$BE = A \bullet \left(1 - \frac{1}{CDF}\right) + R^{case}$$

In case the development pattern is based on paid claims, it follows that:

$$D \bullet \frac{1}{CDF} = AC$$

so that for the best estimate we have:

$$BE = A \bullet \left(1 - \frac{1}{CDF}\right)$$

<u>Bornhuetter-Ferguson proxy based on paid development patterns</u>

TS.IV.D.7 Description

This proxy is a special variant of the general Bornhuetter-Ferguson-based proxy described above using claims development patterns based on paid claims.

TS.IV.D.8 Input

The following information is required for each line of business:

- an average ultimate loss ratio for the accident years not finally settled,

- an adjustment factor for each accident year not finally settled, and
- a market payment pattern.

It is assumed that these parameters have been estimated on a market-wide basis by using risk statistics where the relevant amounts are adjusted for inflation.

TS.IV.D.9 Output

The following output is calculated for each line of business:

- expected future cash-flows by accident year (not finally settled) and maturity date;
- a discounted best estimate for gross provisions for claims outstanding per accident year (not finally settled).

TS.IV.D.10 Calculation

For a given line of business, the various steps in the calculation of the undiscounted best estimate for the provisions for claims outstanding on a gross basis can be summarised as follows:

(1) An inflation-adjusted earned premium ($EPIA_i$) is stipulated for each accident year i by applying a given inflation adjustment factor (IA_i) – normally based on the consumer price index – to the earned gross premium in nominal terms (EP_i), that is: $EPIA_i = EP_i \bullet IA_i$

(2) For each accident year i, the effective loss ratio or market ultimate loss ratio ($MULR_i$) is in practice given, since both the average ultimate loss ratio (LR) and the accident year adjustment factor (AYA_i) are given as input to the undertaking (applying this proxy), that is $MULR_i = LR \bullet AYA_i$,

(3) As also the market payment pattern (MPP_d where d represents the development years) is given to the undertaking, proxies for the provisions for claims outstanding related to the individual accident years ($PCO_{Gross,i}$) are calculated as follows:
$PCO_{Gross,i} = EPIA_i \bullet MULR_i \bullet OP_i$
where:
$OP_i = \sum_{d>I-i} MPP_d$
is the expected outstanding part of the ultimate (inflation adjusted) claims costs and I is the current accounting year.

(4) Finally, the undiscounted (but inflation-adjusted) best estimate for the overall provisions for claims outstanding on a gross basis (PCO_{Gross}) is calculated in the following manner:
$PCO_{Gross} = \sum_{i \le I} PCO_{Gross,i}$

to in (1)–(4) above are evaluated according to the price level at the balance sheet day. This aspect must be taken into account when stipulating the discounted best estimate for the provisions for claims outstanding.

The part of the (inflation-adjusted) provisions for claims outstanding that is expected to be paid at a future maturity date j (j>I) is given by:

$$Y_j = \sum_{i \le I} PCO_{Gross,i} \bullet MPP_{j-i} \quad \text{for j = I+1,…,I+D}$$

where D is the maximum number of development years.

By applying the available risk-free interest curve, the discounted best estimate of the overall provisions for claims outstanding on a gross basis is given as:

$$PCO_{Gross}^{disc} = \sum_{j>I} Y_j \bullet \left(\left(1 + r_j\right) / \left(1 + p\right) \right)^{-j}$$

where r_j denotes the risk-free interest rate corresponding to maturity *j* while *p* denotes the expected future rate of inflation (assumed to be constant for the sake of simplicity).

TS.IV.D.11 Other remarks

It should be noticed that the set-up sketched by (1)–(4) above also applies – with only minor adjustments – in cases where the estimation of the necessary input parameters (LR, AYA_i and MPP_d) are not based on figures (e.g. premiums and paid claims) adjusted for inflation. In such cases the future inflation is implicitly predicted as an average of the recent historic inflation and this fact will be reflected also in the estimated values of the input parameters. Moreover, in this case the earned premiums should not be adjusted for inflation, cf. (1) above, and the discounting should be carried out by using the nominal risk-free interest rate curve (i.e. with p = 0 in the expression for $(PCO_{Gross})^*$).

TS.IV.E. Case-by-case based proxy for claims provisions

TS.IV.E.1 Description

This proxy uses cases-by-case estimates to derive a best estimate of claims provisions. Future inflation has to be taken into account.

It includes an adjustment to take into account claims that have occurred, but have not (yet) been reported (IBNR claims).

Usually case-by-case provisions are resulting from claims settlement staff and therefore it is a priori not transparent if those provisions are under- or over-reserved. Therefore, the proxy includes a further adjustment to take into account expected run-off results from the setting of case-by-case reserves.

This method is based only on individual data of a company and is therefore a rather subjective valuation method. A more objective harmonisation across different company or member states may be difficult to achieve.

TS.IV.E.2 Input

The following input data is required:

- case-by-case provisions for known claims (at end of current year);
- expected frequency and claims average for IBNR claims;
- for each of the last 3 to 5 business years, historic run-off gain/loss on the basis of case-by-case provisions.

TS.IV.E.3 Output

Best estimate of claims provisions (undiscounted and gross of reinsurance).

TS.IV.E.4 Calculation

The best estimate of the claims provision (across all occurrence years) is from the following three components:

+ sum of case-by-case provisions for known claims

+ lump-sum provisions for IBNR incl. IBNR for annuities

- sustainable and reliable estimate of run off gains/losses from last three to five accounting years on the basis of case-by-case provisions

The lump-sum provisions (contingency reserves) for IBNR claims may be estimated by a product like expected frequency x claims average. Both statistics are usually estimated from a time series of claims reported later in following business years. Those statistics should be back-tested.

From the experience of past accounting years an estimation of a sustainable value of settlement results for the set of claims with case-by-case-provisions could be derived as follows (where the calculation should be carried out for each of the last 3 to 5 business years):

+ sum of case-by-case provisions for all claims outstanding at the beginning of the given business year

- payments for such claims of all occurrence years within given business year

- sum of case-by-case provisions for such claims at the end of the business year

To derive a sustainable and conservative estimate, the minimum of the yearly run-off-results from the last 3 to 5 years should be used. This might result in positive as well as in negative values.

TS.IV.E.5 Criteria for application

For an application of this proxy, at least one of the following conditions should hold:

- No reliable data is available in the structure of a run-off triangle; or
- Reliable data is available, but not applicable for statistical portfolio methods (too sparse); or
- the portfolio is small in the context of the proportionality principle.

TS.IV.E.6 Other remarks

This proxy does not include a valuation of annuities arising from non-life insurance obligations (in e.g. worker's compensation business, motor third party liability, liability and accident insurance). This issue is addressed separately in the "annuity proxy".

TS.IV.F. Expected Loss Based proxy

TS.IV.F.1 Description

The expected loss method described in this subsection derives a best estimate for the premium provisions, based on an estimate of the combined ratio in the LOB in question. It is a proxy if it is applied with market loss data instead of undertaking specific data because the company does not have sufficient data or because the data is not stable.

TS.IV.F.2 Input

The following input information is required:

- estimate of the combined ratio (CR) for the LOB during the run-off period of the premium provision
- present value of future premiums for the underlying obligations (as to the extent to which future premiums should be taken into account in the valuation of premium provisions, see section TS.II.B.)
- unearned premium reserve for the underlying obligation (intended to denote the paid premium for the unexpired risk period determined on a *pro rata temporis* basis).

The combined ratio for an accident (= occurrence year) should be defined as the ratio of expenses and incurred claims in a given LOB or homogenous group of risks over earned premiums. The earned premiums should exclude prior year adjustment. The expenses should be those attributable to the premiums earned other than claims expenses. Incurred claims should exclude the run-off result.

Alternatively, if it is more practicable, the combined ratio for an accident year may be considered to be the sum of the expense ratio and the claims ratio. The expense ratio is the ratio of expenses (other than claims expenses) to written premiums and the expenses are those attributable to the written premiums. The claims ratio for an

accident year in a given LOB or homogenous group of risks should be determined as the ratio of the ultimate loss of incurred claims over earned premiums.

TS.IV.F.3 Output

Best estimate of the premium provision (gross of reinsurance).

TS.IV.F.4 Calculation

The best estimate is derived from the input data as follows:

$$BE = CR \bullet UPR + (CR - 1) \bullet PVFP$$

Where:

BE	=	best estimate of premium provision
CR	=	estimate of combined ratio for LOB
UPR	=	unearned premium reserve
$PVFP$	=	Present value of future premiums (discounted using the prescribed term structure of risk-free interest rates)

Where a market development pattern proxy is available for the LOB being measured, a further alternative is to combine such pattern with the expected loss based proxy. This is based on a 3 step approach:

- Estimate the (undiscounted) total claims cost for the next future accident year by multiplying the ultimate claims ratio (based on undiscounted figures) by the (undiscounted) estimate of premiums that will be earned during next year
- Use the market development pattern to split the total claims cost per development year. Discounting can then be applied using the rates applicable to each maturity
- The final step is to add the estimate for the present value of future expenses (based on the estimated expense ratio) and deduct the present value of future premiums

TS.IV.F.5 Criteria for application

The following conditions should be met for an application of this proxy:

- it can be expected that the combined ratio remains stable over the run-off period of the premium provision;
- a reliable estimate of the combined ratio can be made;
- the unearned premium provision is an adequate exposure measure for estimating future claims during the unexpired risk period (until the point in time where the next future premium is expected).

TS.IV.F.6 Other remarks

It should be pointed out that, in cases where the combined ratio is estimated to be lower than 100%, this proxy would lead to introducing future profits in the calculation of the TP. However, this seems to be conceptually consistent with the Solvency II valuation principles.

In some markets, the unearned premium reserves are calculated net of commissions. In such cases, the unearned premium reserves should be adjusted in order to ensure that the use of the combined ratio does not lead to a methodological error. Such an adjustment could be achieved by dividing the unearned premium reserves by (1 - commission rate).

TS.IV.G. Premium-based proxy

TS.IV.G.1 Description

This proxy is intended to derive a best estimate for premium provisions, based on the unearned premium provision and the provision for unexpired risks shown in statutory balance sheets.

TS.IV.G.2 Input

The following input information, from the balance sheet is required for the LOB in question:

- Provision for unearned premiums, i.e. the share of premiums paid (or going to be paid for existing contracts) but not yet earned;
- Provision for unexpired risks (if applicable).

TS.IV.G.3 Output

Best Estimate for the Premium provision.

TS.IV.G.4 Calculation

The best estimate for the premium provision is derived as follows:

BE = (Provision for unearned premiums + Provision for unexpired risks)/(1+i/3)

where i (100 i %) is the risk-free interest rate (for a 1-year maturity) used for the discounting.

TS.IV.G.5 Criteria for application

The premium reserve is supposed to decrease at an even rate during the forthcoming 12 months.

TS.IV.G.6 Other remarks:

It may be noted that using the provision for unearned premiums as a volume measure may only inadequately reflect the need to incorporate all expected cash

flows under the economic-based valuation of premium provisions envisaged in Solvency II. Concerning the extent to which future premiums need to be taken into account, see TS.II.B.32 and following paragraphs.

TS.IV.H. Claims-handling cost-reserves proxies

Factor-based claims-handling-costs proxy

TS.IV.H.1 Description

This proxy is intended to determine the best estimate of the claims handling provision. The best estimate of the claims handling provision should then be added to the best estimate of the claims provision (without unallocated claims expenses) to derive the best estimate for the "full" claims provision including all expenses.

This proxy will not be needed if all expenses related to the settlement of claims are already reflected in the best estimate, for example if settlement expenses are separated by year of occurrence and have been taken into account in a claims triangle calculation of the claims provisions.

The proxy may be applied to either gross, net, accounted or undiscounted claims provisions.

TS.IV.H.2 Input

The following input is required:

- Best estimate of claims provisions per LOB, without reflecting unallocated claims expenses;
- Factors for claims handling costs per LOB and per market.

TS.IV.H.3 Output

Claims handling provisions per LOB.

TS.IV.H.4 Calculation

The calculation of the claims handling provisions is based on the claims provisions per line of business (LOB) and factors applied to them.

TS.IV.H.5 Criteria for application

To apply the proxy, the following criteria should be met:

- Unallocated claims settlement expenses are not included in the cash flows underlying the best estimate calculation of the claims provision, but are given as a total per LoB for the business year.
- The claims portfolio within each LOB is comparable to the average "market" portfolio.

TS.IV.H.6 Other remarks

The following factors are observed average ratios of claims handling provisions over claims provisions in the Swedish market: Sickness and accident 1.5 %, Private P&C 5.7 %, Commercial P&C 3.2 %, Motor hull 7.9 %, Motor 3rd Party Liability 4.3 %, Marine 5.1 %, Transport 2.5 %, Credit 2.1 %, Discharge 5.5 %, Livestock (including Pet animals) 5.9 %.

A company which can be supposed to have a large share of small claims in a LOB is recommended to use a somewhat higher factor then the above-mentioned, and the contrary if it has a large share of severe claims. As the claims handling provision is fairly small compared to the claims provisions, the principle of proportionality applies.

"New York" claims-handling-costs proxy

TS.IV.H.7 Description

Proxy for claim settlement expenses.

TS.IV.H.8 Input

Mean ratio R (e.g. over the 2 past exercises) defined as:

R = Expenses / (gross claims + subrogations).

TS.IV.H.9 Output

Expected claim settlement expenses.

TS.IV.H.10 Calculation

R is applied to a specified percentage of claim reserves (including expected subrogations) and 100 % of IBNR. The specified percentage x could e.g. set as x = 50%.

TS.IV.H.11 Criteria for application

This method is relevant if expenses can reasonably be supposed proportional to reserves (which may not be true for some lines of business).

TS.IV.I. Discounting proxy

TS.IV.I.1 Description

This proxy is intended to convert an undiscounted best estimate of claims provisions into a discounted estimate. It may be combined with either the case-by-case or the frequency-severity proxy described above.

Where estimates for cash flows for individual development year j have been derived, this proxy is not needed, since discounting is a simple division of the cash flow in development year j by the given interest rate of the prescribed term structure curve (see TS.II.B.7 – 14).

The proxy uses a single percentage value per LOB, which represents the factor for

discounting. Further analysis should be undertaken to evaluate the differences in setting these factors among member states and to decide whether for each LOB one single market factor may be used.

TS.IV.I.2 Input

The following input information is required for the given LOB:

- undiscounted best estimate of claims provision (for whole or part of LOB);
- market-wide discounting factor f for LOB.

TS.IV.I.3 Output

The discounted best estimate of the claims provision (for whole or part of LOB).

TS.IV.I.4 Calculation

The discounted best estimate is derived by applying the market-wide discounting factor f to the undiscounted best estimate:

$$BE = (1 - f) \bullet BE^{undiscounted}$$

To derive this factor, the underlying average duration of insurance contracts in the given LOB should be determined. Given this underlying duration, the factor f can determined as follows:

$$1 - f = (1 + i)^{-d}$$

Where:

i = risk-free interest rate corresponding to duration d (taken from risk-free interest rate curve prescribed in QIS4)

d = average duration of insurance contracts in given LOB

TS.IV.I.5 Criteria for application:

The following conditions should be met:

- separate estimates for cash flows in the individual development years are not available;
- the best estimate cannot be calculated from a run-off cash flow triangle by using company specific development pattern or market development patterns.

TS.IV.I.6 Other remarks

The most common situation of the application of this proxy will be in connection with case-by-case provisioning.

With regards to the duration approach to discount provisions, we note that the duration can only be calculated if cash flows are available for each development

year. But, in this situation, a direct calculation of discounted cash flows is possible. Therefore, such an approach has not been additionally described.

For QIS 4, the market-wide discounting factors for the individual LOBs would need to be calibrated by the supervisors in the individual markets. This calibration should also make transparent the assumption on the underlying average modified duration (and the corresponding risk-free interest rate). To illustrate this, the following table shows the factors that were applied for the German market in the QIS 3 exercise:

LOB	discounting factor	based on:
		Dur_{mod}
Accident and health	3%	1,8
Motor, third-party liability	10%	5,8
Motor, other classes	1,5%	0,8
Fire / other property damage	2%	1,1
Third-party liability (private)	4,5%	
Third-party liability (other)	9,5%	5,0
Marine, aviation and transport	2,5%	1,5
Credit and suretyship	2,5%	2,0
Legal expenses	4%	2,5
Assistance	1,5%	0,7
Miscellaneous	2%	1,7
non-proportional reinsurance	0%	

TS.IV.J. Gross-to-net proxies

Gross-to-net-proxy based on case reserves

TS.IV.J.1 Description

This proxy uses a ratio of net over gross of an available portfolio A to estimate the net provision of another portfolio B based on the observable gross provision of portfolio B.

TS.IV.J.2 Input

The following input is required:

- Data set of gross case provisions portfolio A and B
- Data set net case provisions portfolio A

TS.IV.J.3 Output

Ratio net over gross, which can be applied to other portfolios.

TS.IV.J.4 Calculation

Net provision = ratio x observable gross provision

This proxy uses a ratio of net over gross of another portfolio to estimate the provision of another portfolio based on its observable gross provision.

TS.IV.J.5 Criteria for application

The following criteria should be met:

- The benchmark portfolio should be similar to the portfolio for which the proxy is used (substance over form).
- The ratio should be established by means of credible and sustainable data. This requires a data set exceeding at least two years.

TS.IV.J.6 Other remarks

It is noted that ceded reinsurance varies with the size, the financial soundness and the risk aversion of a company, so that particular care is required when applying a ratio of net over gross from another benchmark portfolio. Such an approach should therefore only be used in cases where the benchmark portfolio is known to have a very similar nature as the own portfolio. Even if this is the case, however, the cession percentage for non-proportional reinsurance will heavily depend on the actual occurrence of large losses, and therefore be very volatile.

Gross-to-net proxy based on cumulated flows

TS.IV.J.7 Description

This proxy derives an estimate of net claims provisions on bases of gross claims provisions and an estimate of the recovery rates from reinsurance in individual occurrence years.

For past business years, the reinsurance structure for individual occurrence years is known and will not change retroactively any more. A comparison of net over gross cumulated cash flows per LOB in the past differentiated by year of occurrence may therefore be used to derive an estimate of the recovery rate for proportional and non-proportional reinsurance in the given occurrence year.

TS.IV.J.8 Input

The following input data are required:

- $A_{i,n-i}^{gross}$ and $A_{i,n-i}^{net}$: the gross, resp. net cumulative amount of claims paid (per LOB) for the accident year *i* and development year n-*i*: these are the latest observed values on the diagonal of the net and the gross cash flow triangle.

- R_i^{gross} : Gross best estimates for individual occurrence years *i*.

TS.IV.J.9 Output

The proxy derives:

- quotas r_i (per LOB) for the recovery rates from reinsurance for each year of occurrence *i* for the undiscounted best estimate of claims provisions. These shares are also valid for discounted best estimate;
- the undiscounted best estimate of claims provisions;
- a net best estimate for premium provisions: see "other remarks" below.

TS.IV.J.10 Calculation

For each occurrence year i, the recovery rate ri (i.e., the average rate of recovery from proportional and non-proportional reinsurance) can be estimated as follows:

$$r_i = 1 - \frac{A_{i,n-i}^{net}}{A_{i,n-i}^{gross}}$$

where

$A_{i,n-i}^{net}$ = cumulated net cash flow until given business year for occurrence year *i*

$A_{i,n-i}^{gross}$ = cumulated gross cash flow until given business year for occurrence year *i*

The net best estimate for the claims provisions in occurrence year *i* may then be derived as follows:

$$R_i^{net} = (1 - r_i) \bullet R_i^{gross}$$

The overall net best estimate of the claims provision is given by:

$$R^{net} = \sum_i R_i^{net}$$

TS.IV.J.11 Criteria for application

To apply this proxy, gross as well as net cash flows per year of occurrence need to be available per LOB.

TS.IV.J.12 Other remarks

For newer years and especially the last business year (i = n) the estimated recovery rates r_i might be a little bit too small because 1- r_i will be a bit too high due to IBNR claims. Therefore, the proxy does not lead to an underestimation of the net provision in these cases.

The above mentions ratios r_i are for claims provisions. For premium provisions, i. e. for the current business year, an expected recovery rate can be estimated by 1-*q*,

where q is the share of the proportional part of the reinsurance cover. Because in this case non-proportional reinsurance for the current business year is not taken into account, this is a conservative approach for the ceding insurer.

Co-insurance: Under a coinsurance agreement, the leading insurer has to divide gross claim expenditure into fixed proportions (shares) for deduction with participating insurers. If it is not possible to allocate these shares correctly to the corresponding development year then the following proxies could be applied:

- The leading insurer of an insurance pool treats co-insurance as proportional reinsurance;
- the participating insurer treats co-insurance similar as claims settlement expenses and uses a scaling-to-completion proxy.

TS.IV.K. Annuity proxy

TS.IV.K.1 Description and calculation

Consistent with the substance over form principle, if the amount of provisions for annuities is considered to be not negligible relative to the size of the provisions for claims outstanding of the relevant Non-life LOB, annuities are to be separated from the other Non-life cash flows and valued according to Life principles.

If the amount of provisions is very small (e.g. < 1%) relative to the size of the provisions for claims outstanding of the relevant Non-life LOB, as a first proxy, it is suggested that annuities are included in cash flows for claims outstanding. Thus the best estimate of claims outstanding automatically includes the best estimate of annuities.

Participants are invited to comment on a possible threshold for deciding when the amount of provisions can be considered to be negligible.

Life proxies

TS.IV.L. Life best estimate – proxy 1

For QIS4 purposes, undertakings may apply the following proxy to determine the best estimate of guaranteed benefits for the whole portfolio or a sub-portfolio of their life insurance obligations which are not unit-linked or index-linked provided that they are restricted to guaranteed benefit cash flows and do not include the full value of financial options and guarantees. This simplification may be of help if discretionary benefits and options and guarantees are not relevant (e.g. for non-life annuities) or their value can easily be determined and added to the value of guaranteed benefits.

Let CF_0, …, CF_n be the undiscounted cash flow of the life insurance obligations determined in line with Article 20 of the current life directive 2002/83/EC. Cash-flows relating to surplus funds as defined in Article 90 of the Framework Directive Proposal shall not be allowed for in the cash flow. The best estimate of guaranteed benefits $BE_{guaranteed}$ can be approximated by discounting this cash flow by means of the risk-free interest rate term structure:

$$BE_{guaranteed} \approx \sum_{t=0}^{n} \frac{CF_t}{(1+r_t)^t}$$

where r_t is the risk free rate for maturity t.

Alternatively, a more approximate approach would be:

$$BE_{guaranteed} \approx TP \bullet \frac{\exp(r_{solvency1} \bullet Dur_{\mathrm{mod}})}{\exp(r_{risk-free} \bullet Dur_{\mathrm{mod}})}$$

where:

TP = value of technical provisions as defined in Article 20 of directive 2002/83/EC, excluding surplus funds as defined in Article 90 in the Framework Directive Proposal;

Dur_{mod} = estimate of the modified duration of TP;

$r_{risk\text{-}free}$ = risk free interest rate for the maturity Dur_{mod};

$r_{solvency1}$ = discount rate applied to TP under current life directive.

The formula using technical provisions should be applied to the finest practicably possible segmentation of technical provisions. At least, technical provisions should be segmented according to different discount rates if the formula is used.

The approximated amount for $BE_{guaranteed}$ may not include the full value of discretionary benefits or the full value of financial options and guarantees. Unless these elements of the best estimate are of little significance, an estimate of their value should be added to the approximation of $BE_{guaranteed}$ in order to arrive at an approximation of the best estimate.

TS.IV.M. Life best estimate – proxy 2

If an entity lacks sufficient capabilities to derive the best estimate values as outlined above a first insight for QIS4 purposes only could be obtained as follows:

- Make any necessary simplification of assumptions as outlined above.
- Project the amount of guaranteed benefits and related expense loadings to future points in time.
- Probability weight the guaranteed benefits and related future expense loadings for a given point in time by assuming for the surrender process a constant Poisson hazard intensity and for the expected mortality a constant scaling factor of current mortality assumption in use.
- Calculate the present value of the probability weighted guaranteed liability and related future expense loadings.
- Subtract the present value of the probability weighted guaranteed benefits and related present value of future expense loadings from the amount of reserves currently held (by applying current liability valuation principles) creating a calculatory profit/loss fund.
- If the calculatory fund is positive, assume (if so appropriate) that the present value of expected future expense loadings related to extra benefits equals the calculatory fund multiplied with the present value of expected future expense loadings related to guaranteed benefits divided by the present value of expected future guaranteed benefits. The expected amount of future extra benefits before any considerations of firm specific strategies for distributing extra benefits then equals the calculatory fund less the sum of future expense loadings related to extra benefits and any possible historical average deficiency in the overall expense loadings.
- Take into account firm specific strategies for distributing extra benefits by determining a distribution ratio that takes into account past practise, any contractual or commercial commitments towards the policyholders. The expected amount of future extra benefits after firm specific strategies for distributing extra benefits is then the distribution ratio times the amount of expected future extra benefits before any considerations of firm specific strategies for distributing extra benefits.
- Approximate the expected future expenses by first adding the expected expense loadings from the guaranteed liability and the potential additional expense loadings related to the extra benefits and by multiplying this sum with a possible historical relative deficiency in the expense loadings.
- If the calculatory fund is zero or negative set the expected amount of future extra benefits equal to zero.
- Value other options and guarantees pragmatically for instance by applying the following three steps:

  (a) Estimate the effect on the liability (by also taking into account possible

policyholders' behaviour) if the option or the guarantee is out of the money for all future dates.

(b) Estimate the effect on the liability when the option or the guarantee is for any future date at its maximum amount in the money and also exercised.

(c) The expected cost of the option or guarantee allowing for the probability that the options or guarantee is at the time of exercising in the money or out of the money could be approximated by determining a subjective ad hoc probability that times the difference in b) and a) create an estimate for the cost.

TS.IV.N. Risk Margin proxy

For the purposes of QIS4, where participants are unable to calculate the risk margin using any of the methods set out in TS.II they may use the following risk margin proxy. Participants using this proxy would calculate the risk margin by applying a percentage figure to the best estimate amount (calculated using an appropriate proxy method). The percentages to be used for QIS4 are indicated per line of business in the table below.

Proposition for Proxies for the Risk Margin as percentage of the Best Estimate:	
Workers Compensation	14%
Health Insurance	6%
Accident & Health	12%
Motor liability	13%
Motor other	4%
MAT	10%
Fire & other	6%
3rd party Liability	14%
Credit & suretyship	9%
Legal expenses	5%
Assistance	6%
Miscellaneous	15%
Non-pro-portional reinsuran. Property	17%
Non-pro-portional reinsuran. Casualty	21%
Non-pro-portional reinsuran. MAT	19%

These percentages try to reflect average pay-out patterns. Following QIS4, CEIOPS in collaboration with the Coordination Group set up with the Groupe Consultatif will reflect further on the appropriateness of this approach and its calibration.

Criteria for application

Application of a proxy method for the calculation of the best estimate.

Participants' views on this risk margin proxy and its calibration would be appreciated.

SECTION 2: OWN FUNDS

TS.V. Own Funds

TS.V.A. Introduction

TS.V.A.1 In relation to own funds, the objective of QIS4 is to collect further information so as to build on the information collected in QIS3. Further information is needed because QIS3 specifications were limited to the high level principles set out in the Framework Directive Proposal, which was interpreted rather broadly when classifying own funds into tiers. So as to remedy this problem, QIS4 technical specifications now include much more detailed guidance on how those high level principles could be implemented in practice.

TS.V.A.2 The information received in QIS4 will then be used to develop the implementing measures relating to own funds (see Articles 92, 97 and 99 of the Framework Directive Proposal).

TS.V.A.3 Grandfathering is an issue which may need further analysis and consideration when developing implementing measures, taking into account the results of QIS4. Participants are therefore also invited to give details on how their capital instruments are currently classified under Solvency I.

TS.V.A.4 QIS4 specifications for own funds essentially focus on the implementation of the tiering structure set forth in Articles 93 and 94 of the Framework Directive Proposal, based on a further specification of those principles. Consequently, QIS4 specifications do not request participants to test several sets of assumptions regarding the quantitative limits set out in Article 98 of the Proposal. But with a view to enhancing participants' awareness of the potential changes in own funds as compared to the solvency regime currently in force, the QIS4 spreadsheets will automatically compute and indicate the SCR and MCR coverage ratios, based on participants' own classification of own fund items into tiers and on the quantitative limits set out in the Proposal.

TS.V.B. Principles

TS.V.B.1 The main concern about a particular eligible element is to what extent it meets the characteristics set forth in the Framework Directive Proposal. In QIS4, elements are classified in relation to how well and when they absorb losses compared to paid-up ordinary share capital, or paid-up initial fund. There is a broad spectrum of capital instruments that are potentially eligible in own funds. These include equity instruments with debt-like features, and debt instruments with equity-like features. Member States refer to these instruments using different terms: some consider subordinated liabilities to be hybrid capital instruments, while others consider subordinated liabilities to be distinct from hybrid capital instruments. This specification refers to both hybrid capital instruments and subordinated liabilities; but participants are reminded that what is ultimately relevant is the extent to which a particular instrument holds the qualitative characteristics required for classification in a particular tier.

For QIS4 purposes, the following apply:

- the excess of assets over liabilities is a tier 1 item, with specification of any elements of the excess of assets over liabilities that may be subject to restricted loss absorption. (see the section on ring-fenced structures below, for instance);
- a hybrid capital instrument, regardless of its legal form, can be a tier 1, tier 2 or tier 3 item;
- a subordinated liability can be a tier 1, tier 2 or tier 3 item;
- a promise to provide own funds can be a tier 2 or tier 3 item.

NB: The attention of participants is kindly drawn to the fact that the definition of "subordination" for Solvency II purposes, is similar to the definition used for accounting purposes, i.e. capital items should not only be subordinated to policyholders' interests but to all liabilities which are not explicitly "subordinated" (see art. 93(1)).

TS.V.B.2 Another relevant issue, which is further examined in section TS.V.C below, relates to the transferability of own funds within a company, in particular when ring-fenced structures have been introduced.

TS.V.B.3 As stated in paragraph TS.I.B.6, the Solvency II project has prudential supervision as its exclusive purpose. Therefore, Solvency II is neutral and agnostic with regard to any issue concerning general financial statements or tax issues. As a consequence, QIS4 should not be understood as impacting current accounting or taxation rules. See also the tables in TS.III.A and TS.III.B for further explanation on the treatment of deferred taxes.

TS.V.C. Ring-fenced structures

TS.V.C.1 The following treatment of ring-fenced fund structures has been developed for QIS4 purposes only. It is acknowledged that the treatment of such funds under the Solvency II framework should be further analysed following QIS4, once additional information has been collected during the QIS4 exercise.

TS.V.C.2 Where part of the business of participants is segregated from the rest of their operations in a ring-fenced fund, they should follow the guidance below. “Ring-fenced fund” should be understood as a contractual or legal arrangement whereby part of the assets or eligible surplus of the company are strictly segregated from the rest of the company’s investments or resources and can only be used to meet the insurance and/or reinsurance obligations with respect to which the ring-fenced fund has been established (e.g. "with-profits funds" in the UK and Ireland as well as "segments" in Portugal should be considered as ring-fenced funds). As a consequence, the own funds held within the ring-fenced fund (i.e. the excess of the segregated assets over the insurance and/or reinsurance obligations concerned) can only absorb the losses stemming from the risks associated with the ring-fenced (re)insurance portfolio. The own funds held within the ring-fenced fund are not available to meet the company’s other obligations and cannot be “transferred” from the ring-fenced fund to support the rest of the activity, on a going-concern basis.

TS.V.C.3 Consequently, when assessing the solvency of the company as a whole, it might seem appropriate to adjust the amount of own funds eligible to cover the SCR in order to take

account of the "non-transferability" of the own funds held within ring-fenced funds. The following questions aim at further examining this issue.

General questions on ring-fenced structures

TS.V.C.4 Participants are requested to:

1) mention any existing restrictions on the transferability of own funds within their company, e.g. ring-fenced funds or other arrangements;

2) indicate the number of ring-fenced funds in place in their company;

3) indicate the total amount of own funds held within ring-fenced funds in their company; and

4) describe the transferability restrictions in place with respect to their ring-fenced funds.

Additional information to be collected to assess the potential impact of ring-fenced structures on available own funds for SCR purposes

TS.V.C.5 Since the own funds held within a ring-fenced fund can only be used to cover the losses associated with the ring-fenced (re)insurance portfolio on a going-concern basis, it is necessary to define the extent to which they are considered to contribute to the overall solvency of the company for SCR purposes. For the purposes of responding to the questions in paragraph TS.V.C.6[25], it should be assumed that they can only contribute up to the proportional contribution of the ring-fenced fund in the company's SCR. Concretely, the amount of own funds held within a ring-fenced fund "i" to be taken into account to determine the total amount of available own funds would then be the following:

$$OF*_{fund\ i} = Min\left(OF_{fund\ i}\ ;\ SCR \times \frac{SCR_{fund\ i}}{\sum_j SCR_{fund\ j} + SCR_{other}} \right)$$

With the following:

$OF_{fund\ i}$: the amount of own funds held within the ring-fenced fund "i";

SCR: the overall SCR of the company, as calculated in accordance with section VI of the technical specifications;

$SCR_{fund\ i}$: the SCR calculated at the level of the ring-fenced fund "i", as if it were a distinct company with assets and (re)insurance obligations identical to those of the ring-fenced fund[26];

SCR_{other}: the SCR calculated for the rest of the activity which is not segregated in any ring-fenced fund, as if it were a distinct company with assets and (re)insurance obligations identical to those relating to the rest of the activity (e.g. general investments, other (re)insurance obligations, etc.).

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[25] Consequently, the SCR calculation is not being amended and participants are not required to adjust the available amount of own funds for the purposes of QIS4. They are simply requested to provide additional quantitative information in order to achieve a better understanding of the ring-fenced fund issue.

[26] For consistency reasons, where participants have to retain the highest value of two alternative scenarios to calculate the result of a sub-module or risk module (e.g. for interest rate, upward shock and downward shock), the scenario retained in the case of the overall SCR calculation (e.g. the upward shock) should be also used to calculate each $SCR_{fund\ i}$ as well as SCR_{other}.

TS.V.C.6 Participants are requested to:

- comment on the appropriateness of this method, given their specific circumstances, namely referring to appropriate reflection of the restrictions on the transferability of own funds held within ring-fenced funds;
- comment on the practicability of the method, especially with respect to the calculation of the various components of the cap set out in paragraph TS.V.C.5; and
- indicate the quantitative impact of the cap set out in paragraph TS.V.C.5 on their amount of own funds: what is the percentage of own funds held within ring-fenced funds which are excluded by applying the cap? What is the percentage of the total amount of available own funds which are excluded by applying the cap?[27]

TS.V.C.7 As a simplification for the calculation of the $SCR_{fund\ i}$, participants can follow the procedure set out in Annex Own Funds 1 - TS.XVII.B of the technical specifications.

TS.V.D. Classification of own funds into tiers and list of capital items

TS.V.D.1 For QIS4 purposes, CEIOPS has aimed at further specifying:

- the characteristics set forth in Article 93;
- the meaning of the term "sufficient" in characteristic 4 (perpetuality) of Article 93;
- the meaning of the term "to a substantial degree" in Article 94.

TS.V.D.2 This work has resulted in a detailed list of own fund items included below. The list sets forth, per tier, separately for basic own funds and ancillary own funds, the relevant characteristics and the interpretation of the characteristics (in the column "key features"). The last column indicates what items fall into which tiers.

TS.V.D.3 For QIS4 purposes, participants are requested to provide the amount of each eligible element of capital included in the last column of the list mentioned above.

TS.V.D.4 When working on the list, CEIOPS concluded that the characteristics could be made more operational by proceeding as follows:

- distinguish more clearly between loss absorbency on winding-up and loss absorbency in going concern;
- merge subordination with loss absorption on winding-up;
- distinguish the different elements of mandatory servicing costs.

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[27] If a participant for the purposes of QIS3 calculated an SCR for each fund and aggregated these together to come up with its overall SCR in accordance with paragraph II.3.27-29 of CEIOPS QIS3 Technical Specifications Part II, then it may do so as well in QIS4. In this case rather than providing an indication of the quantitative impact of the cap set out in paragraph TS.V.C.5, the participant in its answer to this question should instead indicate the impact of calculating requirements on a fund by fund basis rather than on a legal entity basis.

TS.V.D.5 As a result, CEIOPS has developed, in the list of tiers, six characteristics that are broadly in line with Article 93:

4) subordination of total amount on winding-up;

5) full loss-absorbency in going concern;

6) undated or of sufficient duration (perpetuality);

7) free from requirements/incentives to redeem the nominal amount;

8) absence of mandatory fixed charges;

9) absence of encumbrances.

TS.V.D.6 For QIS4 purposes, the term "to a substantial degree" applies to characteristics 3 to 6. CEIOPS is working on the basis that characteristics 3 to 6 should be viewed as features to be taken into account when assessing the loss absorbency features in characteristics 1 and 2.

TS.V.D.7 More precisely:

- for inclusion in tier 1 capital a hybrid capital, instrument or subordinated liability must be able to be written down or converted into equity in times of stress, notwithstanding a possible later write up in case of subsequent profits;

- for inclusion in tier 2 capital, any payment (principal or coupon) on a hybrid capital instrument or subordinated liability must be able to be deferred in times of stress until the financial position is restored;

- for inclusion in tier 2 capital, the receipt of a promise to provide own funds must be certain.

TS.V.D.8 The precise level of losses which would trigger conversion or write down of hybrid capital instruments and subordinated liabilities is still under discussion. For QIS4 purposes, participants are requested to classify items according to whether conversion or write down is a contractual provision.

TS.V.D.9 Given the multiplicity of the actual form that hybrid capital instruments, subordinated liabilities and promises to provide own funds can take, participants are requested to provide a specification of each line item qualified as "other", providing brief details of which characteristics those items possess.

TS.V.D.10 The verification of the *perpetuality characteristic* (Key Features 3) for each capital item, using minimum durations (e.g. 5 years or 10 years) as a reference, is still under consideration. The use of minimum durations from the issue date may simplify the assessment of this characteristic and may also enhance cross-sector consistency given the current banking framework. However, fixed minimum durations from the issues date may not be sufficiently risk-sensitive. For QIS 4 purposes, participants are requested to classify in tier 1 those instruments with a maturity from issue date of at least 10 years, and in tier 2 those instruments with a maturity from issue date of at least 5 years. But participants should also provide additional information on the remaining duration of those instruments from the reporting date, as well as information on the duration of their (re)insurance liabilities, in order to allow for detailed analysis.

TS.V.D.11 More precisely, participants are requested to report the following information pieces:

- For undated instruments:

  1) the time period between the issue date and the first call date for instruments with a pure call;

  2) the time period between the issue date and the step-up and call date for instruments with an incentive to redeem; and

  3) the remaining period to the call or the step-up and call date, as at the reporting date

- For dated instruments:

  1) the legal maturity from the issue date;

  2) the time period between the issue date and the call date or the step-up and call date;

  3) the remaining period to the call date or the step-up and call date, as at the reporting date; and

  4) the remaining period to the legal maturity, as at the reporting date.

TS.V.D.12 Participants are also requested to report the average duration of their (re)insurance obligations.

TS.V.E. Ancillary own funds

TS.V.E.1 For all ancillary own fund items, the characteristics and key features should apply to the basic own fund item that arises once the ancillary own fund item has been called up.

TS.V.E.2 In QIS 4, participants are requested to provide the following information in the spreadsheets for all ancillary own fund items which are not mentioned explicitly in Article 96 of the Framework Directive Proposal:

- the status of the counterparties concerned, in relation to their ability and willingness to pay;

- the recoverability of the funds, taking account of the legal form of the item, as well as any conditions which would prevent the item from being successfully called up;

- any information on the outcome of past calls which insurance and reinsurance undertakings have made for such ancillary own funds.

TS.V.E.3 For each ancillary own fund item, participants are also requested to provide information on the valuation basis. If an item is not valued at nominal value, participants are invited to explain why valuation is not at nominal value and provide a description of the valuation basis used and the valuation assumptions made.

TS.V.E.4 In the case of "unbudgeted" supplementary member calls of mutual undertakings other than Protection and Indemnity Associations, participants are requested to provide the following specific information:

- the percentage of the callable amount in relation to the annual earned premium;
- the number of times a call has been made in the past;
- the average default rate based on past calls;
- the average time taken for recovery.

TS.V.F. Examples

TS.V.F.1 In order to facilitate completion of the spreadsheets, some examples are presented below. These examples are purely indicative. Insurers should apply their own judgement to allocate own funds items according to the characteristics for classification of capital items set out below (TS.V.F.2 to TS.V.F.6).

TS.V.F.2 Basic own funds, tier 1

- The excess of assets over liabilities, determined in accordance with QIS4 valuation principles.
    - The balance sheet items which contribute to this difference are mentioned in the list of tiers. Each item, and the amount, must be stated separately.
    - A net surplus on an insurer's scheme for employee benefits, such as post-retirement benefits, is not included in the excess of assets over liabilities unless the net surplus can absorb losses for the benefit of policyholders, because the insurer has a legal claim on the net surplus and can cash the net surplus to settle policyholder claims.
- Budgeted supplementary calls that mutual undertakings can make on their members are eligible for inclusion in the excess of assets over liabilities.
- Subordinated mutual member accounts.
- Non-cumulative perpetual preference shares.
- Non-cumulative fixed-term preference shares with a minimum duration of at least 10 years from the issue date.
- Other hybrid capital instruments which fulfil the criterion of loss-absorbency in going concern. The instrument must be undated or have a minimum maturity of at least 10 years from the issue date. Any interest step-ups must not apply before 10 years from the issue date and must not exceed the higher of 100 basis points or 50% of the initial credit spread.
- Subordinated liabilities which fulfil the criterion of loss-absorbency in going concern. The instrument must be undated or have a minimum maturity of at least 10 years from the issue date. Any interest step-ups must not apply before 10 years from the issue date and must not exceed the higher of 100 basis points or 50% of the initial credit spread.

TS.V.F.3 Basic own funds, tier 2

- Cumulative perpetual preference shares.

- Cumulative fixed-term preference shares with a minimum maturity of at least 5 years from the issue date.

- Other hybrid capital instruments that are either undated or have a minimum maturity of at least 5 years from the issue date. Any interest step-ups must not apply before 5 years from the issue date and must not exceed the higher of 100 basis points or 50% of the initial credit spread.

- Subordinated liabilities that are either undated or which have a minimum maturity of at least 5 years from the issue date. Any interest step-ups must not apply before 5 years from the issue date and must not exceed the higher of 100 basis points or 50% of the initial credit spread.

TS.V.F.4 Basic own funds, tier 3

- Cumulative fixed-term preference shares with a minimum maturity of less than 5 years from the issue date.

- Other hybrid capital instruments that are either undated or have a minimum maturity of less than 5 years from the issue date.

- Subordinated liabilities that are either undated or have a minimum maturity of less than 5 years from the issue date.

TS.V.F.5 Ancillary own funds, tier 2

- Unpaid common shares; unpaid initial fund.

- Unpaid non-cumulative preference shares.

- Unpaid and callable hybrid capital instruments eligible for inclusion in tier 1.

- Letters of credit and guarantees, in accordance with Article 96 of the Framework Directive Proposal.

- Supplementary member calls of Protection and Indemnity Associations in accordance with Article 96 of the Framework Directive Proposal.

- Part of the amount of unbudgeted supplementary member calls by mutual undertakings. These calls are subject to recovery risk, as the callable amount might not be fully received following a call. It is also possible that receipt is delayed so that the claim is not available immediately to cover losses. As a consequence, only part of unbudgeted supplementary member calls can be classified in Tier 2 ancillary own funds, being calls, the recoverability of which is considered certain. For QIS4, 40 % of the maximum callable amount specified in the statutes of the mutual company can be classified in Tier 2 ancillary own funds, and the rest in Tier 3 ancillary own funds.

- Other commitments with equivalent loss absorption to ancillary own fund items mentioned specifically in Article 96 of the Framework Directive Proposal. Participants are requested to provide more qualitative information for these items.

TS.V.F.6 Ancillary own funds, tier 3

- Unpaid cumulative preference shares.
- Unpaid and callable hybrid capital instruments eligible for inclusion in tier 2 or tier 3.
- Letters of credit and guarantees not eligible for inclusion in tier 2.
- Supplementary member calls of mutual undertakings not eligible for inclusion in tier 2.
- Other commitments not eligible for inclusion in tier 2.

TS.V.G. Intangible assets

TS.V.G.1 For the treatment of intangibles, see the section on the valuation of assets and other liabilities (TS.I.B.4).

TS.V.H. Participations and subsidiaries in the own funds of the parent company at solo level

TS.V.H.1 For the treatment of participations, participants are referred to the technical specifications on the SCR (TS.VI.E) as well as Annex SCR 1 on participations and subsidiaries (see TS.XVII.C).

TS.V.I. Group support

TS.V.I.1 For the reporting of group support, participants are invited to refer to the technical specification on groups (see TS.XVI.I).

TS.V.J. Optional reporting

Hybrid capital instruments

TS.V.J.1 It has been considered whether it is appropriate to classify an item wholly in one tier. An alternative or complementary approach could be to split an item into its capital and debt components. Because of the apparent complexity of this approach, and the divergence of this approach from IFRS, classifying an item wholly in one tier has been taken as the default position.

TS.V.J.2 In case of disagreement with this approach, participants may report separately, what the classification becomes, if they split an item into its capital and debt components. For this additional and optional reporting, participants are invited to provide full details of the instrument concerned and how the split has been made.

Mutual undertakings: "unbudgeted" supplementary member calls

TS.V.J.3 The appropriate split of unbudgeted supplementary member calls between tier 2 and tier 3. Under Article 96, future claims which Protection and Indemnity Associations may have against their members by way of a call for supplementary contributions, within the financial year, are classified in tier 2. Accordingly, it has seemed appropriate to allow similar claims, within the financial year, in tier 2 as well. It has also seemed appropriate to allow a portion of other claims in tier 2.

TS.V.J.4 For QIS4, The amount of other claims to be classified in tier 2 has been set equal to 40% of the claims which can be called within the financial year, whereas the remaining 60% should be classified in tier 3. This level is however open to discussion and participants may suggest alternative methods. Participants are invited to explain how calls should be classified in their view.

TS.V.K List of tiers/characteristics/features/items for QIS4 purposes

Tiers	Characteristics	Key Features	Items
TS.V.K.1. **Tier 1**	(1) Subordination of total amount on winding up (2) Full loss-absorbency in going concern (3) Perpetuality (undated/sufficient duration)	(1) the total amount of the item must be subordinated to all claims of policyholders and all other senior creditors (2) the item: ➢ must be able to absorb any losses either because it is common equity or at a pre-determined trigger point (1) by means of a write down of the principal amount as long as losses persist or (2) through conversion into common equity or settlement exclusively in stock ➢ must not hinder the recapitalisation of the insurer (3) the item: ➢ must be undated or of sufficient duration in relation to the insurance obligations it covers (ie. It must have a minimum maturity of at least 10 years from the issue date); and ➢ must be contractually locked in at a pre-determined trigger point (i.e. redemption is postponed), where redemption is only allowed if the item is replaced by an item of capital of equivalent quality or if the	The excess of assets over liabilities: ➢ paid up and called up common equity (common share capital, initial fund) with redemption subject to prior supervisory approval, ➢ reserves available to absorb losses, including: - retained earnings - share premium account - surplus funds (Art. 96 of the Framework Directive Proposal) - revaluation reserves - other reserves available to absorb losses for the benefit of all policyholders (to be specified by participants) - Other reserves, the loss absorption capacity of which is restricted (to be specified by participants, stating separately for each reserve its nature and the restriction)

Tiers	Characteristics	Key Features	Items
		supervisory authority has given prior approval	Subordinated mutual member accounts
	(4) Free from requirements/incentives to redeem the nominal amount	(4) the item must be ➢ free from any requirements to redeem the item prior to its legal maturity (subject to the lock-in referred to above); ➢ free from any incentives to redeem (i.e. step-ups must not apply before 10 years from issue date and must not exceed a prescribed level (the higher of 100 bps or 50% of the initial credit spread)	Hybrid capital instruments–provided they have loss-absorbency equivalent to common equity, e.g. - non-cumulative perpetual preference shares, - non-cumulative fixed term preference shares, - others (to be specified by participants)
	(5) Absence of mandatory fixed charges	(5) at a pre-determined trigger point based on the firm's MCR, any coupons must be: ➢ able to be cancelled; or ➢ able to be deferred for an indefinite term, where coupons are non-cash cumulative and can only be settled in common equity or a new issue of hybrid securities, which have characteristics of the same or higher quality	provided they possess the key features in the preceding column. For all hybrid capital instruments full details should be given on the remaining periods to maturity and to call and step-up dates, as set out in TS.V.D.10 - TS.V.D.12. Details should also be given of any Alternative Coupon Satisfaction Mechanism (ACSM) that is permitted under the terms of the instrument. For example:
	(6) Absence of encumbrances	(6) ➢ the item must have no encumbrances such as guarantees of payment, hypothecation or any other restrictions or charges which cannot be cancelled by the insurer if a prescribed level	- ACSM (coupons can be statisfied through the issue of common equity) - APSM (coupons can be satisfied through

Tiers	Characteristics	Key Features	Items
		of loss is sustained, unless they are entered into for the benefit of policyholders, ➢ the holder must not be entitled to set off any claims under the instrument against any claims the insurer has against him, ➢ the insurer must not be entitled to set off any claims it has against the holder's redemption claim, because such a set-off would constitute early redemption	the issue of other hybrid securities of the same or better quality) - Payment in Kind (PIK) (coupons are settled through an increase in the principal value of the instrument) Subordinated liabilities provided they have loss-absorbency equivalent to common equity, e.g. - perpetual subordinated liabilities, - others (to be specified by participants) provided they possess the key features in the preceding column. For all subordinated liabilities full details should be given on the original and remaining periods to maturity and to call and step-up dates, as set out in TS.V.D.10 - TS.V.D.12. Details should also be given of any Alternative Coupon Satisfaction Mechanism (ACSM) that is permitted under the terms of the instrument (as above). Finally, for all hybrid instruments and subordinated liabilities, participants should also indicate the average duration of their (re)insurance liabilities, see TS.V.D.12.

Tiers	Characteristics	Key Features	Items
TS.V.K.2 **Tier2-basic own funds**	(1) Subordination of total amount on winding up (3) Perpetuality (undated/sufficient duration) (4) Free from requirements/incentives to redeem the nominal amount	(1) the total amount of the item must be subordinated to all claims of policyholders and all other senior creditors (3) the item: ➢ must be of sufficient duration in relation to the insurance obligations it covers (ie. must have a minimum maturity of at least 5 years from the issue date); and ➢ must be contractually locked in at a pre-determined trigger point (i.e. redemption is postponed), where redemption is only allowed if the item is replaced by an item of capital of equivalent quality or if the supervisory authority has given prior approval (4) the item must be ➢ free from any requirements to redeem the item; ➢ free from any incentives to redeem (i.e. step-ups must not apply before 5 years from issue date and must not exceed a prescribed level (the higher of 100 bps or 50% of the initial credit spread)	Hybrid capital instruments with a duration of at least 5 years from the issue date, e.g. • cumulative preference shares, • others (to be specified by participants) provided they possess the key features in the preceding column. For all hybrid capital instruments full details should be given on the original and remaining periods to maturity, and to call and step-up dates, as set out in TS.V.D.10 - TS.V.D.12**.** Subordinated liabilities with a minimum maturity of at least 5 years from the issue date, e.g. • fixed term subordinated liabilities, • others (to be specified by participants) provided they possess the key features in the preceding column. For all subordinated liabilities full details should be given on the original and remaining periods to maturity and to call and step-up dates, as set out in TS.V.D.10 - TS.V.D.12**.**

Tiers	Characteristics	Key Features	Items
	(5) Absence of mandatory fixed charges (6) Absence of encumbrances	(5) at a pre-determined trigger point based on the firm's MCR, any coupons must be able to be deferred for an indefinite term (6) ➢ the item must have no encumbrances such as guarantees of payment, hypothecation or any other restrictions or charges which cannot be cancelled by the insurer if a prescribed level of loss is sustained, unless they are entered into for the benefit of policyholders, ➢ the holder must not be entitled to set off any claims under the instrument against any claims the insurer has against him, ➢ the insurer must not be entitled to set off any claims it has against the holder's redemption claim, because such a set-off would constitute early redemption	Finally, for all hybrid instruments and subordinated liabilities, participants should also indicate the average duration of their (re)insurance liabilities, see TS.V.D.12.
TS.V.K.3 **Tier 2 - ancillary own funds**	(1) Subordination of total amount on winding up (2) Full loss-absorbency in going concern	(1) the total amount of the item must be subordinated to all claims of policyholders and all other senior creditors (2) the item: ➢ must be able to absorb any losses either because it is common equity or at a pre-determined trigger point (1) by means of a	The eligibility of the following should be tested against the characteristics and key features of the item that arises through making the relevant claim. Unpaid common share capital, unpaid initial fund, unpaid non-cumulative preference share capital;

Tiers	Characteristics	Key Features	Items
		write down of the principal amount as long as losses persist or (2) through conversion into common equity or settlement exclusively in stock ➢ must not hinder the recapitalisation of the insurer	Unpaid and callable hybrid capital instruments eligible for inclusion in tier 1
	(3) Perpetuality (undated/sufficient duration)	(3) the item: ➢ must be undated or of sufficient duration in relation to the insurance obligations it covers (ie. must have a minimum maturity of at least 10 years from the issue date); and ➢ must be contractually locked in at a pre-determined trigger point (i.e. redemption is postponed), where redemption is only allowed if the item is replaced by an item of capital of equivalent quality or if the supervisory authority has given prior approval	Letters of credit and guarantees: - Cf. art. 96 (ex article 95)of the Directive Proposal, - other letters of credit and guarantees with equivalent loss absorption to letters of credit and guarantees, cf. art. 96 of the Framework Directive Proposal (to be specified by participants)
	(4) Free from requirements/incentives to redeem the nominal amount	(4) the item must be ➢ free from any requirements to redeem the item prior to its legal maturity (subject to the lock-in referred to above); ➢ free from any incentives to redeem (i.e. step-ups must not apply before 10 years from issue date and must not exceed a prescribed	Future claims by way of "unbudgeted" supplementary calls that a mutual insurer can make on its members - P&I claims, cf. art. 96 of the Framework Directive Proposal, - other claims by way of supplementary calls with equivalent loss absorption to P&I future claims (to be specified by

Tiers	Characteristics	Key Features	Items
	(5) Absence of mandatory fixed charges	level (the higher of 100 bps or 50% of the initial credit spread) (5) at a pre-determined trigger point based on the firm's MCR, any coupons must be: ➢ able to be cancelled; or ➢ able to be deferred for an indefinite term, where coupons are non-cash cumulative and can only be settled in common equity or a new issue of hybrid securities, which have characteristics of the same or higher quality	participants) - 40% of other claims by way of supplementary member calls (to be specified by participants) Other commitments with equivalent loss absorption to ancillary own fund items mentioned specifically in art. 96 of the Framework Directive Proposal (to be specified by participants)
	(6) Absence of encumbrances	(6) ➢ the item must have no encumbrances such as guarantees of payment, hypothecation or any other restrictions or charges which cannot be cancelled by the insurer if a prescribed level of loss is sustained, unless they are entered into for the benefit of policyholders, ➢ the holder must not be entitled to set off any claims under the instrument against any claims the insurer has against him, ➢ the insurer must not be entitled to set off any claims it has against the holder's redemption claim, because such a set-off would constitute early redemption	

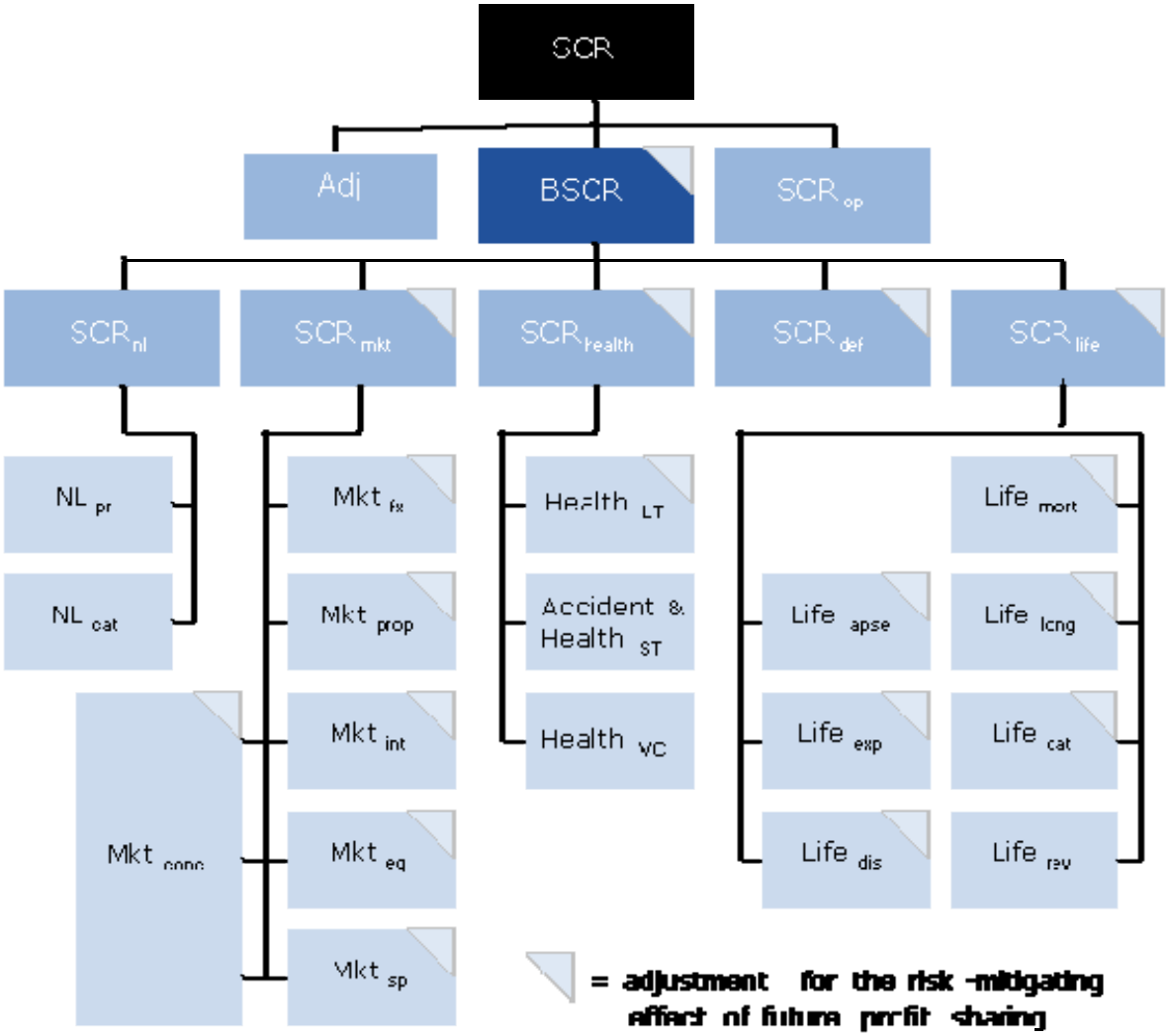
Tiers	Characteristics	Key Features	Items
TS.V.K.4 **Tier 3-basic own funds**	Assets less liabilities and subordinated debt not meeting characteristics of Tier 1 or 2 but full subordination on winding up.	(1) the total amount of the item must be subordinated to all claims of policyholders and all other senior creditors.	Hybrid capital instruments with a minimum maturity of less than 5 years from the issue date, e.g. - cumulative preference shares, - others (to be specified by participants). Full details should be given on the original and remaining periods to maturity, as set out in TS.V.D.10 - TS.V.D.12. Subordinated liabilities with a minimum maturity of less than 5 years from the issue date, e.g. - fixed term subordinated liabilities, - others (to be specified by participants). Full details should be given on the original and remaining periods to maturity, as set out in TS.V.D.10 - TS.V.D.12. Finally, for all hybrid instruments and subordinated liabilities, participants should also indicate the average duration of their (re)insurance liabilities, see TS.V.D.12.
TS.V.K.5 **Tier 3-ancillary**	Not meeting characteristics of Tier 2, but full subordination on winding up	(1) the total amount of the item must be subordinated to all claims of policyholders and all other senior creditors	Unpaid and callable hybrid capital instruments (including cumulative preference shares) eligible for inclusion in tier 2

Tiers	Characteristics	Key Features	Items
own funds			Letters of credit and guarantees not eligible for inclusion in tier 2 (to be specified by participants) 60% of other mutuals' unbudgeted supplementary member calls that can be made Other commitments not eligible for inclusion in tier 2 (to be specified by participants)

TS.VI. SCR General Remarks

TS.VI.A. Overview

TS.VI.A.1 The SCR standard formula calculation is divided into modules as follows:



TS.VI.A.2 For each module, the instruction is split into the following sub-sections:

- Description: this defines the scope of the module, and gives a definition of the relevant sub-risk;
- Input: this lists the input data requirements;
- Output: this describes the output data generated by the module; and
- Calculation: this sets out how the output is derived from the input.

TS.VI.A.3 The principle of substance over form should be followed in determining how risks are to be treated. For instance, where claims in payments are payable in the form of an annuity (for

example in motor insurance), agreed claims should normally be part of SCR_{life}, unless the impact of the associated risk on the risk capital charges for the individual risk modules can be expected to be negligible.

TS.VI.A.4 For the purposes of the SCR standard formula calculation specified in this section, technical provisions should be valued in accordance with the specifications laid out in TS.II. To avoid any circularity in the calculation, any reference to technical provisions within the calculations for the individual SCR modules is to be understood to exclude the cost-of-capital risk margin.

TS.VI.B Segmentation of risks for non-life and health insurance business

TS.VI.B.1 The analysis of non-life underwriting risk will require a segmentation of the participant's non-life insurance business into individual lines of business (LoBs). This follows the segmentation specified for the valuation of non-life technical provisions, as laid out in paragraphs TS.II.E.1 to TS.II.E.7, except that the first three lines of business are for SCR calculation purposes classified in the SCR health underwriting risk module.

TS.VI.B.2 The Health underwriting risks for different types of health business in the EEA should be allocated in the following way:

SCR Health module:

- Long-term sub-module should be used for long-term health business practiced on a similar technical basis to that of life insurance with additional restrictions according to National Law (as sold in Germany and Austria).

- Short-term sub-module should be used for the health and accident lines of business that are part of the non-life business.

- Workers' compensation sub-module should be used for the workers compensation and similar lines of business. This should be used for both long-term and short-term types of workers' compensation. Workers' compensation includes many of the risks of the life underwriting risk module (such as longevity, revision and expenses). However, the appropriate instructions on how these should be combined for the workers' compensation line of business are included within the workers' compensation sub-module.

SCR Life underwriting module:

- Disability sub-module should be used for long-term health business other than that included within the long-term sub-module within Health.

- Catastrophe sub-module should be used for all lines of business (long-term and short-term, including workers' compensation) which are exposed to the policyholder experiencing mortality, morbidity or disability underwriting risk .

Dutch health insurance:

- The instructions in Annex SCR 5 should be used for compulsory health insurance for Dutch citizens (Annex SCR 5 – TS.XVII.G).

UK alternative disability risk sub-module within Life underwriting:

- The instructions in Annex 6 set out an alternative to the disability risk sub-module within the life underwriting risk module (Annex SCR 6 - TS.XVII.H).

Following considerable industry feedback on the structure of the modules, further work will be undertaken on the treatment of health business going forward.

TS.VI.C. Market risk on assets in excess of the SCR ("free assets")

TS.VI.C.1 In QIS3, participants were invited to supply, as additional information, an overall SCR estimate where the assets to be taken into consideration were limited to those required to back the total of the technical provisions and the SCR. This means that no capital charge would be applied in respect of free assets in excess of the SCR.

TS.VI.C.2 This testing proposal is not in line with the Framework Directive Proposal, which is based on a total balance sheet approach. Therefore, QIS4 no longer includes this testing proposal.

TS.VI.D. Valuation of intangible assets for solvency purposes

TS.VI.D.1 For the calculation of the SCR, when participants are requested to input the value of assets, in accordance to the specifications on the valuation of assets and liabilities other than technical provisions, intangible assets (including goodwill) are to be valued at nil.

TS.VI.E. Intra-group participations

TS.VI.E.1 Where an undertaking (called "parent") has a participation or a subsidiary in another undertaking, this participation or subsidiary should be treated as defined in Annex SCR 1 – TS.XVII.C.

TS.VI.F. Undertaking-specific parameters

TS.VI.F.1 Participants may, within the design of the standard formula, replace one or a subset of its parameters by parameters specific to the undertaking concerned when calculating the underwriting risk modules. This option can be taken provided that the participant uses for the calculation of its own specific parameters the same standardized methods adopted for the calculation of the standard parameters, including distributional assumptions. If another distribution was used, then a partial internal model would be required.

TS.VI.F.2 Scope of application of undertaking-specific parameters:

Given the current availability of explicit standardized methods, the use of undertaking-specific parameters is limited in QIS4 to certain parameters of the non life and health ("Accident and health short term" and "Workers compensation") underwriting risk modules. For the calculation of the standard parameters for these modules, CEIOPS has used a log-normal assumption.

TS.VI.F.3 However, this does not preclude a more extensive application to other parameters, including in the "life" and "long-term health" module in the future. Further work on these modules will be conducted after QIS4. Therefore, participants are invited to supply additional

information and comments on potential alternative standardized methods and the way they could lead to sets of undertaking-specific parameters for the "life" and “long-term health” risk modules.

TS.VI.F.4 Insurance and reinsurance undertakings may replace one or several of the following parameters of the non-life and health underwriting risk modules by parameters specific to their business:

- the standard deviation for reserve risk in individual LoB $\sigma_{(res,lob)}$ and
- the standard deviation for premium risk in individual LoB $\sigma_{(prem,lob)}$.

TS.VI.F.5 Participants should use the standardised methods defined in Annex SCR 2 – TS.XVII.D. Participants’ comments are invited on these proposed standardised methods.

TS.VI.F.6 Participants are also invited to comment on whether there is a statistically significant difference between undertaking-specific parameters and standard parameters.

TS.VI.F.7 Finally, the internal data of the undertaking used to replace the standard parameters of the underwriting risk modules should be complete, accurate and appropriate as well as directly relevant for the operations of the undertaking. Undertakings are invited to provide information as to how they would justify that the data used meet completeness, accuracy, and appropriateness requirements.

TS.VI.G. Simplifications in SCR

TS.VI.G.1 According to the proportionality principle the undertakings may use simplified methods and techniques to calculate the SCR, using actuarial methods and statistical techniques that are proportionate to the nature, scale and complexity of the risks they support.

TS.VI.G.2 Simplified methods may be employed in the valuation of SCR where the result so produced is not material or not materially different from that which would result from a more accurate valuation process. If the criteria outlined in the following paragraph are satisfied, i.e. the criteria are expected to be met, simplified actuarial methods and statistical techniques may be used. Of course participants, who are unable to calculate the value using the standard method, are not required to do it to demonstrate that the difference as compared to the simplified method is immaterial.

TS.VI.G.3 Simplified actuarial methods and statistical techniques may be used if:

- the types of contracts written for each line of business is not complex (e.g. path dependency does not have a significant effect; for example: life contract that doesn’t include any options or guarantees, non-life insurance that doesn’t include options for renewals);

and

- the line of business is simple by nature of the risk (e.g. insured risks are stable and predictable; for example: term assurance, insurance of damage to land motor vehicles)

and

- any additional nature and complexity standards set out for each SCR calculation are met

and

- the SCR that is valued in the simplified approach is not material in absolute terms or relative to the overall size of the total SCR. For the purpose of QIS4, please use the following guidance on materiality for when simplifications may be used for the SCR:
    - the SCR resulting from the simplified approach is no more than 50 million Euro for life business, and 10 million Euro for non-life business; for composites the same threshold apply on each part of the business, life and non-life;

    or

    - the value of each capital charge (pre-diversification) determined with simplified methods for each risk is no more than 10% of the total SCR;

    and

    - the sum of the capital charges (pre-diversification) determined with simplified methods is no more than 30% of the total SCR

TS.VI.G.4 If a participant (e.g. a captive (re)insurer) does not meet the threshold indicated, but nevertheless thinks it should be allowed to apply a simplified approach because of the specificities of its situation, it can do so provided that it 1) explains the reasons for this and 2) indicates the criteria it considers relevant in its situation. The participant is also invited to carry-out the more accurate calculation to allow CEIOPS to benchmark the simplified calculation.

TS.VI.G.5 All participants are invited to comment on the level of the threshold.

TS.VI.G.6 Additional criteria can be set for a specific simplification, in relation to the nature of the simplification itself. For example, in order to determine the interest rate sub-module in the market risk, a simplified calculation according to the duration approach can be made on the value of assets and liabilities other than technical provisions if they have no embedded options and the convexity of the curve does not lead to a material error.

TS.VI.G.7 For clarity, all simplifications have been included in boxes.

TS.VI.H. Adjustments for the risk absorbing properties of future profit sharing

TS.VI.H.1 For with-profits business in life insurance, the specification of the standard formula calculation takes into account the risk absorption ability of future profit sharing. This is achieved by a three step "bottom up" approach as follows:

TS.VI.H.2 The first step is to calculate the capital requirements for individual sub-risks – for example, interest rate risk – under two different assumptions:

- that the insurer is able to vary its assumptions on future bonus rates in response to the shock being tested, based on reasonable expectations and having regard to plausible management decisions ($nMkt_{int}$ or $nXXX_{yyy}$); and

- that the insurer is not able to vary its assumptions on future bonus rates in response to the shock being tested (Mkt_{int} or XXX_{yyy})

TS.VI.H.3 Performing these two calculations for different risks reflects the fact that the ability to vary policyholder benefits will depend on the nature of the shock to which the insurer is exposed. For example, the potential for risk mitigation might be more significant in the case of yield curve movements than, say, a shock to property values.

TS.VI.H.4 The second step is to aggregate both kinds of capital requirement separately, using the relevant correlation matrices. The results are two overall capital charges (excluding operational risk), one derived from capital charges including the risk absorbing effect of future profit sharing on sub-module level (aggregate of the nSCRs), and one derived from capital charges disregarding this effect (the Basic SCR, BSCR).

TS.VI.H.5 The final step is to determine an adjustment Adj_{FDB} to the Basic SCR by comparing both overall capital charges. Generally, the adjustment is given by the difference between the Basic SCR and the aggregate of the *nSCR*s.

However, the adjustment for the loss absorbing capacity of future discretionary bonuses itself can never exceed the total value of future discretionary bonuses (*FDB*).

Therefore:

Adj_{FDB} = min(*BSCR* – aggregate of *nSCR*s; *FDB*)

This upper bound to the adjustment is necessary to prevent double counting of risk absorbing effects on the sub-module level in the determination of the capital charge.

TS.VI.H.6 More detailed descriptions of this “three step approach” are included in the technical specifications for the individual modules laid out below.

TS.VI.H.7 If a participant wishes to simplify the process – particularly in cases where the risk absorbing effect is not expected to be material – it may simply declare the calculation including the risk absorbing effects of future profit sharing to be equal to the calculation excluding the risk absorbing effects of future profit sharing (i.e., it may put $nMkt_{int}=Mkt_{int}$).

"Lower boundary SCR"

TS.VI.H.8 One of the important results from QIS3 is that the assessment of "reasonable expectations" and " plausible management decisions" varies between undertakings. Whilst this is unsurprising as they will depend upon established market practice, past company practice and communications with policyholders, it makes it difficult to benchmark the results and check that the assumed management actions are realistic and achievable.

TS.VI.H.9 For example, some undertakings in QIS3 had a policy of lowering the yield to policyholders to the maximum acceptable by the policyholders before triggering massive lapsation rates.

TS.VI.H.10 Whereas other undertakings (e.g. mutuals) may consider that their own funds "belong" to their policyholders, and therefore reduce their own funds to the maximum extent compatible with the required minimum solvency ratio in order to maintain unaltered the yield to the policyholders.

TS.VI.H.11 Starting from two identical balance sheets (assets and liabilities), these two approaches will result in different absorbing effects, and therefore SCR capital charges.

TS.VI.H.12 In order to help understand the impact of the differing assumptions made as well as the reasonableness of those assumptions undertakings are requested to provide details of the assumptions they have made regarding future management actions and in particular how these compare to the assumptions set out below for the calculation of a "Lower boundary SCR". Undertakings are also requested to provide an estimate of the quantitative impact of applying their own assumptions rather than those outlined for the "Lower boundary SCR" below.

Assumptions for the Lower boundary SCR

TS.VI.H.13 A Lower boundary SCR is one where undertakings assume that as far as possible the undertaking passes on the impact of shocks to policyholders (reducing the yield) rather than absorb the loss themselves using own funds.

TS.VI.H.14 In the case when the potential payment to the policyholder is constrained by a lower bound (such as contractual or regulatory minimal yield) without being able to absorb the full impact of the shock, then the maximum absorbing effect acceptable under this assumption corresponds to the loss borne by the policyholders by lowering the payment with due respect to this lower bound (and the management is supposed to lower the own funds to absorb the remaining part of the shock that has not been borne by the policyholders).

TS.VI.H.15 The Lower boundary SCR thus corresponds to the SCR that is the most reduced, by applying management risk absorbing decisions that maximise the loss to the policyholders, as opposed to the SCR disregarding the risk absorbing effect of future profit-sharing i.e. the SCR that is the least reduced (no reduction) by applying management risk absorbing decisions not to transfer any of the loss to the policyholders.

TS.VI.I. Adjustments for the risk absorbing properties of deferred taxation

TS.VI.I.1 The specification of the standard formula calculation set out in the following sections should take account of the risk absorbing capacities offered by deferred taxation. Participants should take the following approach:

- Firstly, the liability for deferred taxation within the current (pre-stress) balance sheet should be excluded from the pre-stress balance sheet.
- The BSCR should be calculated as in sections TS.VIII to TS.XIII below. All references to change in net asset value should be interpreted to exclude the potential change in deferred taxes.
- The capital requirement for operational risk should be calculated as in section TS.VIII.B below.
- The liability for deferred taxes should be recalculated based on the assumption that the undertaking makes an immediate loss equal to the value of the calculated SCR.

TS.VI.I.2 The change in the liability for deferred taxes (the current liability for deferred taxes minus the recalculated liability for deferred taxes after the SCR) should be added to the adjustment for loss absorbency capacity of technical provisions (i.e. used to reduce the SCR).

TS.VI.I.3 Where the technical provisions include tax liabilities charged to policyholders, this should be included within the calculation of the BSCR below in order to accurately value options and guarantees. Where this is the case, participants should ensure that the

undertaking's liability for taxation in the 99.5% event (following the SCR) and the amount passed to policyholders underlying the SCR are consistent.

TS.VI.I.4 Participants may use a range of simplifications to calculate the allowance for deferred and future taxation within the technical provisions and the adjustment for loss absorbency as a result of deferred taxes within the SCR.

TS.VII. SCR Risk Mitigation

TS.VII.A. General approach to risk mitigation

TS.VII.A.1 The effect of risk mitigation techniques should be given adequate recognition in reducing the relevant risk capital charges.

TS.VII.A.2 Risk mitigation includes both traditional and non-traditional risk transfer instruments on the asset side (e.g. financial hedging) and on the liability side (e.g. hedging instruments, reinsurance).

TS.VII.A.3 The SCR should allow for the effects of risk mitigation through:

- a reduction in requirements commensurate with the extent of risk transfer; and
- appropriate treatment of any corresponding risks that are acquired in the process.

TS.VII.A.4 To simplify the overall treatment of risk mitigation in the context of the standard formula calculation of the SCR, these two effects are separated:

- the extent of the risk transfer is recognised in the assessment of the individual risk modules; and
- the acquired counterparty risks (e.g., in the case of reinsurance, in the event of the reinsurer's default) are captured in the counterparty default risk module.

Implicitly, the operational risk charge also addresses the risk of risk mitigation failure.

TS.VII.B. Requirements on the recognition of risk mitigation tools

TS.VII.B.1 The underlying impact on risk associated with risk mitigation should be treated consistently, regardless of the legal form of the protection. Risk mitigation arrangements should be legally effective and enforceable in all relevant jurisdictions.

TS.VII.B.2 Risk mitigation arrangements should provide appropriate assurance as to the risk mitigation achieved, having regard to the approach used to calculate the extent of risk transfer and the degree of recognition in the SCR.

TS.VII.B.3 A set of principles on financial risk mitigating tools (therefore, excluding reinsurance) is laid out which may be used to define minimum requirements on the allowance of such tools with respect to a standard formula calculation of the SCR. These principles are inspired by requirements in the banking sector on the credit quality of the provider of the risk mitigation instrument.

TS.VII.B.4 Participants are invited to comment on the appropriateness of these principles in the context of a standard formula calculation of the SCR.

TS.VII.B.5 In cases where participants apply risk mitigation instruments for the calculation of the QIS4 standard formula SCR which do not fulfil the principles included below, and where such

mitigating instruments have a significant impact on the SCR, it is recommended that the participant indicates which of the principles were violated, and gives an estimation of the impact of the instruments out of the scope of the Specifications on the SCR estimate.

TS.VII.B.6 The allowance for risk mitigating effects in the standard formula SCR is restricted to instruments and excludes processes and controls the firm has in place to manage the investment risk. For example, where a firm has a dynamic investment strategy (for example, delta-hedging or cash-flow matching), a firm should calculate the capital charge assuming that they continue to hold their current assets during the change in financial conditions i.e. the change in financial conditions should be treated as being an instantaneous shock).

TS.VII.C. Principle 1: Economic effect over legal form

TS.VII.C.1 For standard SCR purposes, financial risk mitigating instruments that have a material impact on an insurance undertaking's risk profile, should be recognised and treated equally, regardless of their legal form or accounting treatment, provided that their economic or legal features do not oppose to the principles and rules required for such recognition.

TS.VII.C.2 Where financial risk mitigation instruments are recognised in the SCR calculation, any material new risks shall be identified and the capital required at the 99.5th confidence level quantified. This includes any basis risk between the firm's liability and the risk mitigation instrument. The additional capital required should be included within the SCR.

TS.VII.D. Principle 2: Legal certainty, effectiveness and enforceability

TS.VII.D.1 The instruments used to provide the financial risk mitigation together with the action and steps taken and procedures and policies implemented by the insurance undertaking shall be such as to result in risk mitigation arrangements which are legally effective and enforceable in all relevant jurisdictions.

TS.VII.D.2 The insurance undertaking shall take all appropriate steps, for example a sufficient legal review, to ensure and confirm the effectiveness and continuing enforceability of the financial risk mitigation arrangement and to address related risks.

TS.VII.D.3 In case the full effectiveness or continuing enforceability cannot be verified, the risk mitigation instrument shall not be recognised in the SCR calculation.

TS.VII.D.4 Undocumented or deficiently documented financial risk mitigation instruments should not be considered, not even on a partially sufficient basis, for standard SCR purposes.

TS.VII.E. Principle 3: Liquidity and ascertainability of value

TS.VII.E.1 To be eligible for recognition, the financial risk mitigation instruments relied upon shall have a value over time sufficiently reliable to provide appropriate certainty as to the risk mitigation achieved.

TS.VII.E.2 Regarding liquidity, QIS4 specifications do not contain any concrete requirement, but only the following two general statements:

(a) The insurer should have written guidance regarding liquidity requirements that financial risk mitigation instruments should meet, according the objectives of the own insurer's risk management policy,

(b) Financial risk mitigation instruments considered to reduce the SCR have to meet the liquidity requirements established by the own entity.

TS.VII.E.3 Comments are welcome on liquidity requirements, if any, that may be sensible to impose, especially regarding financial risk mitigation instruments with a long term.

TS.VII.E.4 The standard SCR calculation should recognise financial risk mitigation techniques in such a way that there is no double counting of mitigating effects.

TS.VII.E.5 Where the risk mitigation instrument reduces risk the capital requirement should be no higher than if there were no recognition in the standard SCR of such mitigation instruments. Where the risk mitigation instrument actually increases risk, then the SCR should be increased.

TS.VII.F. Principle 4: Credit quality of the provider of the risk mitigation instrument

TS.VII.F.1 Providers of financial risk mitigation should have an adequate credit quality to guarantee with appropriate certainty that the insurer will receive the protection in the cases specified by the contracting parties. Credit quality should be assessed using objective techniques according generally accepted practices.

TS.VII.F.2 As a general rule, when the insurer applies the standard calculation for a certain risk module, only financial protection provided by entities rated BBB or better will be considered in the assessment of SCR. In the event of the default, insolvency or bankruptcy of the provider of the financial risk mitigation instrument – or other credit event set out in the transaction document – the financial risk mitigation instrument should be capable of liquidation in a timely manner or retention. The degree of correlation between the value of the instruments relied upon for risk mitigation and the credit quality of their provider shall not be undue, i.e. is material positive.

TS.VII.G. Principle 5: Direct, explicit, irrevocable and unconditional features

TS.VII.G.1 Financial mitigating instruments only can reduce the capital requirements if:

(a) They provide the insurer a direct claim on the protection provider (direct feature),

(b) They contain explicitly reference to specific exposures or a pool of exposures, so that the extent of the cover is clearly defined and incontrovertible (explicit feature),

(c) They do not contain any clause, the fulfilment of which is outside the direct control of the insurer, that would allow the protection provider unilaterally to cancel the cover or that would increase the effective cost of protection as a result of certain developments in the hedged exposure (irrevocable feature),

(d) They do not contain any clause outside the direct control of the insurer that could prevent the protection provider from being obliged to pay out in a timely manner in the event that a loss occurs on the underlying exposure (unconditional feature).

TS.VII.H. Special features regarding credit derivatives

TS.VII.H.1 Reduction of standard SCR based on the mitigation of credit exposures by using credit derivatives will be allowed when the insurer has in force generally applied procedures for this purposes and considers generally admitted criteria. Requirements set out in other financial sectors for the same mitigating techniques will be considered as generally applied procedures and admitted criteria.

TS.VII.H.2 In order for a credit derivative contract to be recognised, the credit events specified by the contracting parties must at a minimum cover:

- failure to pay the amounts due under terms of the underlying obligation that are in effect at the time of such failure (with a grace period that is closely in line with the grace period in the underlying obligation);

- bankruptcy, insolvency or inability of the obligor to pay its debts, or its failure or admission in writing of its inability generally to pay its debts as they become due, and analogous events;

- and restructuring of the underlying obligation, involving forgiveness or postponement of principal, interest or fees that results in a credit loss event. Since the definition of 'restructuring' is not fully harmonised at international level, for QIS4 purposes the precise identification of this event will be left to the own insurer's discretion, according its risk management policy.

TS.VII.I. Collateral

TS.VII.I.1 A collaterised transaction is one in which insurers have a credit exposure or potential credit exposure and it is hedged in whole or in part by collateral posted by a counterparty or by a third party on behalf of the counterparty.

TS.VII.I.2 In addition to the general requirements for legal certainty, the legal mechanism by which collateral is pledged or transferred must ensure that the insurer has the right to liquidate or take legal possession of it, in a timely manner, in case of any event of the counterparty set out in the transaction documentation (and, where applicable, of the custodian holding the collateral).

TS.VII.I.3 Insurers must have clear and robust procedures for the timely liquidation of collateral to ensure that any legal conditions required for declaring the default of the counterparty and liquidating the collateral are observed, and that collateral can be liquidated promptly.

TS.VII.I.4 Unless it becomes impossible according market conditions, admissible collateral for standard SCR purposes must protect the insurer against the same events listed in this paper for credit derivatives.

TS.VIII. SCR Calculation Structure

TS.VIII.A. Overall SCR calculation

Description

TS.VIII.A.1 The SCR is the Solvency Capital Requirement.

Input

TS.VIII.A.2 The following input information is required:

$BSCR$	=	Basic Solvency Capital Requirement
SCR_{op}	=	The capital charge for operational risk
Adj	=	Adjustment for the risk absorbing effect of future profit sharing and deferred taxes

Output

TS.VIII.A.3 This module delivers the following output information:

SCR	=	The overall standard formula capital charge

Calculation

TS.VIII.A.4 The SCR is determined as:

$$SCR = BSCR - Adj + SCR_{Op}$$

Calibration

TS.VIII.A.5 The parameters and assumptions used for the calculation of the SCR are intended to reflect a VaR risk measure (calibrated to a confidence level of 99.5%) and a time horizon of one year.

TS.VIII.A.6 To ensure that the different modules of the standard formula are calibrated in a consistent manner, these calibration objectives have been applied to each individual risk module, while also taking account of any model error arising from the particular technique chosen to assess that risk.

TS.VIII.A.7 For the aggregation of the individual risk modules to an overall SCR, linear correlation techniques are applied. The setting of the correlation coefficients is intended to reflect potential dependencies in the tail of the distributions, as well as the stability of any correlation assumptions under stress conditions.

TS.VIII.B. SCR_{op} operational risk

Description

TS.VIII.B.1 Operational risk is the risk of loss arising from inadequate or failed internal processes, people, systems or external events. Operational risk also includes legal risks. Reputation risks and risks arising from strategic decisions do not count as operational risks. The operational risk module is designed to address operational risks to the extent that these have not been explicitly covered in other risk modules.

Input

TS.VIII.B.2 The inputs for this module are:

TP_{life} = Total life insurance technical provisions (gross of reinsurance)

$TP_{life\text{-}ul}$ = Total life insurance technical provisions for unit-linked business (gross of reinsurance)

TP_{nl} = Total non-life insurance technical provisions (gross of reinsurance)

It concerns all the Lines of business in non-life (as described in TS.II.E.1) excluding the risks related to annuities in lines of business:

• Accident and health – workers' compensation

• Accident and health – health insurance

• Accident and health –others not included under first two items

TP_h = Total health insurance technical provisions (gross of reinsurance)

It concerns the risks related to both long term health insurance and annuities in lines of business:

• Accident and health – workers' compensation

• Accident and health – health insurance

• Accident and health –others not included under first two items

$Earn_{life}$ = Total earned life premium (gross of reinsurance)

$Earn_{life\text{-}ul}$ = Total earned life premium for unit-linked business (gross of reinsurance)

$Earn_h$ = Total earned health insurance premium (gross of reinsurance)

It concerns the risks related to both long term health insurance and to annuities in lines of business :

• Accident and health – workers' compensation

• Accident and health – health insurance

• Accident and health –others not included under first two items

$Earn_{nl}$ = Total earned non-life premium (gross of reinsurance)

It concerns all the Lines of business in non-life (as described in TS.II.E.1) excluding the risks related to annuities in lines of business :

- Accident and health – workers' compensation
- Accident and health – health insurance
- Accident and health –others not included under first two items

Exp_{ul} = Amount of annual expenses (gross of reinsurance) incurred in respect of unit-linked business[28]

$BSCR$ = The Basic SCR

Output

TS.VIII.B.3 This module delivers the following output information:

SCR_{op} = Capital charge for operational risk

Calculation

TS.VIII.B.4 The capital charge for operational risk is determined as follows:

$$SCR_{op} = \min\left\{0.30 \bullet BSCR; Op_{\ln ul}\right\} + 0.25 \bullet Exp_{ul}$$

where

Op_{lnul} = Basic operational risk charge for all business other than unit-linked business (gross of reinsurance)

is determined as follows:

$$OP_{\ln ul} = \max\left\{\begin{array}{c} 0.03 \bullet (Earn_{life} - Earn_{life-ul}) + 0.02 \bullet Earn_{nl} + 0.02 \bullet Earn_{h} \\ 0.003 \bullet (Tp_{life} - Tp_{life-ul}) + 0.02 \bullet Tp_{nl} + 0.002 \bullet Tp_{h} \end{array}\right\}$$

TS.VIII.B.5 The cap (0.3*BSCR) restricting SCR_{op} to a percentage of the other capital requirements (BSCR) is provided in Article 106 (3) of the Framework Directive Proposal.

[28] Administrative expenses should be used (excluding acquisition expenses), calculation should be based on the latest years expenses and not on future projected expenses.

TS.VIII.C. Basic SCR calculation and the adjustment for risk absorbing effect of future profit sharing and deferred taxes

Description

TS.VIII.C.1 BSCR is the Solvency Capital Requirement before any adjustments, combining capital charges for five major risk categories.

Input

TS.VIII.C.2 The following input information is required[29]:

SCR_{mkt}	=	Capital charge for market risk
SCR_{def}	=	Capital charge for counterparty default risk
SCR_{life}	=	Capital charge for life underwriting risk
SCR_{nl}	=	Capital charge for non-life underwriting risk
SCR_{health}	=	Capital charge for health underwriting risk
FDB	=	Total amount in technical provisions corresponding to future discretionary benefits
$nSCR_{life}$	=	Capital charge for life underwriting risk including the risk absorbing effect of future profit sharing
$nSCR_{health}$	=	Capital charge for health underwriting risk including the risk absorbing effect of future profit sharing
$nSCR_{mkt}$	=	Capital charge for market risk including the risk absorbing effect of future profit sharing
$nSCR_{def}$	=	Capital charge for counterparty default risk including the risk absorbing effect of future profit sharing

Output

TS.VIII.C.3 The module delivers the following output:

$BSCR$	=	Basic Solvency Capital Requirement
Adj	=	Adjustment for the risk absorbing effect of future profit sharing and deferred taxes
$nBSCR$	=	net Basic Solvency Capital Requirement

[29] Where for market risk, life underwriting risk and health underwriting risk the capital charges SCR are not including the potential risk absorbing effect of future profit sharing.

Calculation

TS.VIII.C.4 BSCR, Adj and nBSCR are determined as follows:

$$BSCR = \sqrt{\sum_{rxc} CorrSCR_{r,c} \cdot SCR_r \cdot SCR_c} \,,$$

$$Adj = Adj_{FDB} + Adj_{DT} \,,$$

$$nBSCR = BSCR - Adj_{FDB} \,,$$

where

$CorrSCR_{r,c}$	=	the cells of the correlation matrix CorrSCR
SCR_r, SCR_c	=	Capital charges for the individual SCR risks according to the rows and columns of the correlation matrix CorrSCR
Adj_{FDB}	=	Adjustment for the risk absorbing effect of future profit sharing
Adj_{DT}	=	Adjustment for the risk absorbing effect of deferred taxes

and CorrSCR is defined as follows:

$CorrSCR=$	SCR_{mkt}	SCR_{def}	SCR_{life}	SCR_{health}	SCR_{nl}
SCR_{mkt}	1				
SCR_{def}	0.25	1			
SCR_{life}	0.25	0.25	1		
SCR_{health}	0.25	0.25	0.25	1	
SCR_{nl}	0.25	0.5	0	0.25[30]	1

TS.VIII.C.5 The adjustment for the risk absorbing effect of future profit sharing is defined as follows:

$$Adj_{FDB} = \min\left(\begin{pmatrix} \sqrt{\sum_{r,c} CorrSCR_{r,c} \cdot SCR_r \cdot SCR_c} \\ -\sqrt{\sum_{r,c} CorrSCR_{r,c} \cdot nSCR_r \cdot nSCR_c} \end{pmatrix}_{FDB}\right),$$

where

$nSCR_r$, $nSCR_c$	=	Capital charges for the individual SCR risks including the risk absorbing effect of future profit sharing

[30] Due to the integration in the health module of lines of business that were in the non-life underwriting module in QIS 3, the correlation between SCR_{health} and SCR_{nl} has changed from 0 to 0.25.

FDB = Value of future discretionary bonuses

TS.VIII.C.6 The adjustment for the risk absorbing effect of deferred taxes is defined as follows:

$$Adj_{DT} = \Delta DeferredTaxes \mid SCRshock$$

i.e. the absolute value of the reduction in the value of deferred taxes under the scenario SCR shock, where

ΔDeferredTaxes = Absolute value of the reduction in deferred taxes

SCR shock = Immediate loss of basic own funds of the amount $BSCR - Adj_{FDB} + SCR_{Op}$

Further information on the calculation of the adjustment can be found in TS.VI.I.

TS.VIII.C.7 Simplification

When undertakings use the simplified method based on the profit sharing life insurance Italian system described in the in paragraph TS.II.D.76 to calculate the best estimate, they will apply the following formula to evaluate the adjustment for the risk absorbing effect of future profit sharing:

$$Adj = +0{,}1 \bullet FDB$$

TS.VIII.C.8 Alternative method for loss absorbing capacity of future profit sharing and deferred taxes.

Firms should use the following scenario-based method to calculate the adjustment for the loss absorbing capacity of technical provisions and deferred taxes, where they suspect that those effects are not linearly correlated between risk-modules as assumed in the calculation set out in section TS.VI.H. The approach involves replacing the application of the SCR Standard Formula by a single scenario test (covering all of the risks included in the SCR Standard Formula). The particular combination of simultaneous shocks to be used by the participant is determined using the spreadsheet provided for this purpose as part of the QIS4 package. This single scenario is referred to as "the single equivalent scenario". The single equivalent scenario derives a linear approximation of the BSCR standard formula, taking into account the specific risk profile of the firm, and uses this approximation to identify a scenario underlying the SCR (See Annex SCR 7 - TS.XVII.I) for more information on the rationale for use of and the derivation of the single equivalent scenario).

In order to calculate the adjustment for the loss-absorbing capacity of technical provisions and deferred taxes using the single equivalent scenario, participants should carry out the following five steps:

1) The participant should first calculate the capital charge for each sub-risk module in the SCR standard formula using the relevant sections of this document. The calculation should be calculated assuming that assumptions about future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the shocks being tested (i.e. the sub-module SCRs).

2) The participant should then determine the single equivalent scenario it should apply using the spreadsheet provided for this purpose as part of the QIS4 package, by introducing in the "input" sheet the capital charges calculated in step 1. The spreadsheet, first, calculates the relative importance (weightings) of each of the sub-risks in the participant's overall SCR. Then the spreadsheet uses those weightings to determine what simultaneous shocks (e.g. interest rates, equity, etc) should be used by the participant in the single equivalent scenario. The single equivalent scenario to be used is automatically displayed in the output tab of the spreadsheet. Please note that since the relative importance of each of the sub-risks will vary from company to company, the single equivalent scenario applied will also vary from company to company[31].

3) The participant should consider what management actions they would take in the single equivalent scenario and in particular how their assumptions regarding future bonus rates would change in the event that such a scenario would occur.

4) The participant should then calculate the change in the undertaking's net asset value in the face of the equivalent scenario, taking into account management actions identified in step 3 as well as the loss-absorbing capacity of deferred taxes. The calculation of the change in net asset value should be performed on the assumption that all the shocks making up the single equivalent scenario occur simultaneously and that the undertaking makes an operational risk loss equal to SCR_{op} within the equivalent scenario (in order to ensure that the loss absorbing capacity of deferred taxes is properly captured).

5) Finally, the participant should calculate the "Adjustment for the loss absorbing capacity of technical provisions and deferred taxes" as follows:

$$Adj = BSCR + SCR_{op} - SCR_{net}$$

Where :

BSCR is calculated as in TS.VIII.C.4 (i.e. the aggregation of the capital charges referred to in step 1)

SCR_{op} is calculated as in TS.VIII.B.4

[31] Where a participant believes that the calculation of the capital charge for each sub-risk module used in step 1 does not provide the most accurate view of the relative importance of each sub-risk, the participant may use an alternative set of weights to derive the single equivalent scenario. In this case it should justify its choice of weights and explain how they were derived. For example, empirical studies in one Member State indicate that using the capital charges for the individual SCR risks including changes in future bonus rates (i.e. the nSCRs) provides a more accurate picture of the relative importance of risks. However the participant should, on a best efforts basis, still make the default calculation in this case and disclose the result. In particular, they should disclose the BSCR and the value of future discretionary bonuses.

SCR_{net} is the change in the undertaking's net asset value in the face of the equivalent scenario calculated in step 4.

For the calculation of some risk modules (interest rate risk, currency risk and lapse risk), undertakings are required to consider both an increase and a decrease in parameters. Undertakings should satisfy themselves that the direction of the change in parameters continues to be appropriate within the scenario test. This may be done by further sensitivity testing or by another method e.g. considering more than one scenario.

As defined from TS.VI.H.8 to TS.VI.H.15, undertakings are also requested to calculate the change in the undertaking's net asset value in the face of the single equivalent scenario on the basis of the following extreme assumption used in the determination of the "lower boundary SCR".

In response to the scenario, the management of the undertaking is assumed to decide to reduce the benefits paid to the policyholder as much as possible in order that the impact of the simultaneous shocks on the amount of own funds is minimised.

TS.IX. SCR market risk module

TS.IX.A. Introduction

Description

TS.IX.A.1 Market risk arises from the level or volatility of market prices of financial instruments. Exposure to market risk is measured by the impact of movements in the level of financial variables such as stock prices, interest rates, real estate prices and exchange rates.

TS.IX.A.2 For policies where the policyholders bear the investment risk (such as unit-linked policies), the undertaking will remain exposed to market risks where the value of the charges taken from these policies is dependent on fund performance. Exposure to interest rates will occur where fixed charges are received in the future. The value of any options and guarantees embedded within these contracts may also be exposed to market risk.

TS.IX.A.3 Where an undertaking has purchased derivatives, provided they accord with the principles of TS.VII, the risk mitigating/increasing effect should be considered within each sub-module (for example, currency forwards should be considered alongside the insurers other exposures within the currency risk sub-module). Where the financial instrument does not accord to the principles of TS.VII, their risk mitigating effect should be excluded from the calculation of the SCR.

TS.IX.A.4 Risk exposures of collective investment schemes should be allocated to sub-modules on a look-through basis if possible and on a best effort basis otherwise.

Where a collective investment scheme is not sufficiently transparent to allow a reasonable best effort allocation, reference should be made to the investment mandate of the scheme. It should be assumed that the scheme invests in accordance with its mandate in such as manner as to produce the maximum overall charge. For example, it should be assumed that the scheme invests in currencies other than the undertaking's reporting currency to the maximum possible extent permitted by the investment mandate. It should be assumed that the scheme invests assets in each rating category, starting at the lowest category permitted by the mandate, to the maximum extent. If a scheme may invest in a range of assets exposed to the risks assessed under this module, then it should be assumed that the proportion of assets in each exposure category is such that the overall charge is maximised.

As a third choice to the look-through and mandate-based methods, participants should consider the collective investment scheme as an equity investment and apply the global equity risk charge (if the assets within the collective investment scheme are predominately listed) or other risk charge (if the assets within the collective investment scheme are predominately unlisted).

Input

TS.IX.A.5 The following input information is required[32]:

Mkt_{int} = Capital charge for interest rate risk

Mkt_{eq} = Capital charge for equity risk

Mkt_{prop} = Capital charge for property risk

Mkt_{sp} = Capital charge for spread risk

Mkt_{conc} = Capital charge for risk concentrations

Mkt_{fx} = Capital charge for currency risk

$nMkt_{int}$ = Capital charge for interest rate risk including the risk absorbing effect of future profit sharing

$nMkt_{prop}$ = Capital charge for property risk including the risk absorbing effect of future profit sharing

$nMkt_{sp}$ = Capital charge for spread risk including the risk absorbing effect of future profit sharing

$nMkt_{conc}$ = Capital charge for concentration risk including the risk absorbing effect of future profit sharing

$nMkt_{fx}$ = Capital charge for currency risk including the risk absorbing effect of future profit sharing

$nMkt_{eq}$ = Capital charge for equity risk including the risk absorbing effect of future profit sharing

Output

TS.IX.A.6 The module delivers the following output:

SCR_{mkt} = Capital charge for market risk[33]

$nSCR_{mkt}$ = Capital charge for market risk including the risk absorbing effect of future profit sharing

Calculation

TS.IX.A.7 The market sub-risks should be combined to an overall charge SCR_{mkt} for market risk using a correlation matrix as follows:

$$SCR_{mkt} = \sqrt{\sum_{rxc} CorrMkt_{r,c} \bullet Mkt_r \bullet Mkt_c}$$

[32] Where for all subrisks the first six capital charges *Mkt* are not including the potential risk absorbing effect of future profit sharing.

[33] Not including the potential risk absorbing effect of future profit sharing.

where

$CorrMkt_{r,c}$ = the cells of the correlation matrix CorrMkt

Mkt_r, Mkt_c = Capital charges for the individual market risks according to the rows and columns of the correlation matrix CorrMkt

and the correlation matrix CorrMkt is defined as:

CorrMkt	Mkt_{int}	1. Mkt_{eq}	2. Mkt_{prop}	3. Mkt_{sp}	4. Mkt_{conc}	5. Mkt_{fx}
Mkt_{int}	1					
Mkt_{eq}	0	1				
Mkt_{prop}	0.5	0.75	1			
Mkt_{sp}	0.25	0.25	0.25	1		
Mkt_{conc}	0	0	0	0	1	
Mkt_{fx}	0.25	0.25	0.25	0.25	0	1

TS.IX.A.8 The capital charge for $nSCR_{mkt}$ is determined as follows:

$$nSCR_{mkt} = \sqrt{\sum_{rxc} CorrMkt_{r,c} \cdot nMkt_r \cdot nMkt_c}$$

TS.IX.A.9 In order to test the impact of a different correlation situation, as has been observed during the recent and earlier periods of market turmoil, CEIOPS will carry out a sensitivity analysis by testing a new correlation factor between equity and interest rate risk, leading to an alternative SCR value.

To this end, the correlation factor of 0 between Mkt_{eq} and Mkt_{int} will be replaced by a positive correlation factor of 0.25 in the scenario of a downward movement of the interest rate and by a negative correlation factor of - 0.25 in the case of an upward movement of the interest rate. The results of this sensitivity analysis will be published in the final QIS4 report.

TS.IX.B. Mkt_{int} interest rate risk

Description

TS.IX.B.1 Interest rate risk exists for all assets and liabilities of which the net asset value is sensitive to changes in the term structure of interest rates or interest rate volatility. Assets sensitive to interest rate movements will include fixed-income investments, insurance liabilities, and financing instruments (loan capital) and interest-rate derivatives. Liability cash-flows received in the future will be sensitive to a change in the rate at which those cash-flows are discounted.

The value of assets and liabilities sensitive to interest rate changes can be determined using the (prescribed in Annex TP1 – TS.XVII.A) term structure of interest rates ('zero rates'). This term structure can, of course, change over the period of a year.

Input

TS.IX.B.2 The following input information is required:

NAV = Net value of assets minus liabilities

Output

TS.IX.B.3 The module delivers the following output:

Mkt_{int}^{Up} = Capital charge for interest rate risk after upward shocks[34]

Mkt_{int}^{Down} = Capital charge for interest rate risk after downward shocks[35]

Mkt_{int} = Capital charge for interest rate risk[36]

$nMkt_{int}^{Up}$ = Capital charge for interest rate risk after upward shock including the risk absorbing effect of future profit sharing

$nMkt_{int}^{Down}$ = Capital charge for interest rate risk after downward shock including the risk absorbing effect of future profit sharing

$nMkt_{int}$ = Capital charge for interest rate risk including the risk absorbing effect of future profit sharing

Calculation

TS.IX.B.4 The capital charge for interest rate risk is determined as the result of a pre-defined scenario:

$$Mkt_{int}^{Up} = \Delta NAV|_{upwardshock}$$

$$Mkt_{int}^{Down} = \Delta NAV|_{downwardshock}$$

where $\Delta NAV|_{upwardshock}$ and $\Delta NAV|_{downwardshock}$ are the changes in the net value of asset and liabilities due to re-valuing all interest rate sensitive instruments using altered term structures[37].

Where an undertaking is exposed to interest rate movements in more than one currency, the capital charge for interest rate risk should be calculated based on the same relative change on all relevant yield curves.

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34 Not including the potential risk absorbing effect of future profit sharing.
35 Not including the potential risk absorbing effect of future profit sharing.
36 Not including the potential risk absorbing effect of future profit sharing.
37 For the purposes of the specifications, the expression ΔNAV is used with the sign convention that positive values of ΔNAV signify losses.

TS.IX.B.5 The altered term structures are derived by multiplying the current interest rate curve by $(1+s^{up})$ and $(1+s^{down})$, where both the upward stress $s^{up}(t)$ and the downward stress $s^{down}(t)$ for individual maturities t are specified as follows:

Maturity t (years)	*1*	*2*	*3*	*4*	*5*	*6*	*7*
relative change $s^{up}(t)$	0.94	0.77	0.69	0.62	0.56	0.52	0.49
Relative change $s^{down}(t)$	-0.51	-0.47	-0.44	-0.42	-0.40	-0.38	-0.37

Maturity t (years)	*8*	*9*	*10*	*11*	*12*	*13*	*14*
relative change $s^{up}(t)$	0.46	0.44	0.42	0.42	0.42	0.42	0.42
relative change $s^{down}(t)$	-0.35	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34

Maturity t (years)	*15*	*16*	*17*	*18*	*19*	*20+*
relative change $s^{up}(t)$	0.42	0.41	0.40	0.39	0.38	0.37
relative change $s^{down}(t)$	-0.34	-0.33	-0.33	-0.32	-0.31	-0.31

For example, the "stressed" 10-year interest rate $R_1(10)$ in the upward stress scenario is determined as

$$R_1(10) = R_0(10) \bullet (1 + 0.42)$$

where $R_0(10)$ is the 10-year interest rate based on the current term structure.

TS.IX.B.6 The scenarios for interest rate risk should be calculated under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the shocks being tested.

TS.IX.B.7 Additionally, the result of the scenarios should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charges are $nMkt_{int}^{Up}$ and $nMkt_{int}^{Down}$.

TS.IX.B.8 The capital charge for interest rate risk is derived from the type of shock that gives rise to the highest capital charge including the risk absorbing effect of future profit sharing:

If $nMkt_{int}^{Up} > nMkt_{int}^{Down}$ then $nMkt_{int} = \max(nMkt_{int}^{Up},0)$ and $Mkt_{int} = Mkt_{int}^{Up}$ if $nMkt_{int} > 0$ and = 0 otherwise

If $nMkt_{int}^{Up} \leq nMkt_{int}^{Down}$ then $nMkt_{int} = \max(nMkt_{int}^{Down},0)$ and $Mkt_{int} = Mkt_{int}^{Down}$ if $nMkt_{int} > 0$ and = 0 otherwise

TS.IX.B.9 Simplification

In order to determine the interest rate scenario effect on the value of assets and liabilities, a simplified calculation may be used whereby changes in value are estimated as the yield curve change multiplied by the relevant modified duration separately for the assets and for the liabilities. The condition to be met for using this simplification is that the cash-flows of the item are not interest-rate sensitive, in particular the item has no embedded options.

This simplification may be used for assets, non-life technical provisions and other liabilities. This simplification should not be used for life technical provisions.

The shocks are parallel yield stress, at all durations of:

Downward shock: - 40%

Upward shock: + 55 %

TS.IX.C. Mkt_{eq} equity risk

Description

TS.IX.C.1 Equity risk arises from the level or volatility of market prices for equities. Exposure to equity risk refers to all assets and liabilities whose value is sensitive to changes in equity prices.

TS.IX.C.2 For equity risk, a distinction can be made between systematic risk and idiosyncratic risk. The latter one arises out of inadequate diversification. Systematic risk refers to the sensitivity of the equity's returns to the returns of market portfolios, and cannot be reduced by diversification. Therefore it is also called undiversifiable risk.

TS.IX.C.3 The equity risk sub-module is intended to capture systematic risk, whereas idiosyncratic equity risk is addressed in the concentration risk sub-module.

TS.IX.C.4 The equity risk module uses indices as risk proxies, meaning that the volatility and correlation information is derived from these indices. It is assumed that all equities can be allocated to an index of the provided set.

TS.IX.C.5 The assumed shock scenarios for the individual indices reflect the systematic risk inherent to this market portfolio. It is assumed that the equity portfolio of the insurance companies have the same exposure to systematic risk as the index (the risk proxy) itself. It is therefore assumed that the beta is 1.

TS.IX.C.6 For the calculation of the risk capital charge, hedging and risk transfer mechanisms should be taken into account according to the principles of TS.VII. However, as a general rule, hedging instruments should only be allowed with the average protection level over the next year. For example, where an equity option provides protection for the next six months, as a simplification, undertakings should assume that the option only covers half of the current exposure.

Participants should not assume to purchase additional hedging instruments (for example, as part of a rolling hedging programme) beyond those in force at the balance sheet date within the standard formula SCR.

Input

TS.IX.C.7 The following input information is required:

NAV	=	The net value of assets minus liabilities

Output

TS.IX.C.8 The module delivers the following output:

Mkt_{eq}	=	Capital charge for equity risk
$nMkt_{eq}$	=	Capital charge for equity risk including the risk absorbing effect of future profit sharing

Calculation

TS.IX.C.9 For the determination of the capital charge for equity risk, the following indices are considered, where the equity index "Global" comprises equity listed in EEA and OECD countries, and the equity index "Other" comprises equity listed only in emerging markets, non-listed equity, hedge funds and other alternative investments[38]:

No.	*Index*
1	Global
2	Other

TS.IX.C.10 The calculation is carried out in two steps as follows:

TS.IX.C.11 In a first step, for each index i a capital charge is determined as the result of a pre-defined stress scenario for index i as follows:

$$Mkt_{eq,i} = max\left(\Delta NAV \,\middle|\, equity\ shock_i ; 0\right)$$

where

$equity\ shock_i$	=	Prescribed fall in the value of index *i*
$Mkt_{eq,i}$	=	Capital charge for equity risk with respect to index *i*,

and where the equity shock scenarios for the individual indices are specified as follows:

	Global	*Other*
$equity\ shock_i$	32%	45%

TS.IX.C.12 The capital charge $Mkt_{eq,i}$ is determined as the immediate effect on the net value of asset and liabilities expected in the event of the stress scenario equity $shock_i$ taking account of

[38] For the treatment of participations, participants have to refer to the Annex SCR 1 – TS.XVII.C.

all the participant's individual direct and indirect exposures to equity prices. It should be assumed that the participant's equity portfolio has the same exposure to the systematic risk as the index (the risk proxy) itself. It should therefore be assumed that the beta is 1.

TS.IX.C.13 For the determination of this capital charge, all equities and equity type exposures have to be taken into account, including private equity as well as certain types of alternative investments, excluding equity owned in an undertaking part of the same group for which the "Solvency II" Framework Directive Proposal is applicable, representing more than 20 % of the capital of this undertaking when using the deduction aggregation method.

TS.IX.C.14 Alternative investments should cover all types of equity type risk like hedge funds, derivatives, managed futures, investments in SPVs etc., which can not be allocated to spread risk or classical equity type risk.

TS.IX.C.15 The attribution of individual equity positions to one of the indices i has to be determined in a straightforward manner, on a best efforts basis.

TS.IX.C.16 The equity exposure of mutual funds should be allocated on a "look-through" basis. If this is not feasible, the exposure has to be attributed on a best effort basis. Furthermore this could be waived if the mutual fund invests for example solely in European equities with no special individual hedging instruments. Then it is possible to consider the equity fund as one single equity for the output calculation.

TS.IX.C.17 In a second step, the capital charge for equity risk is derived by combining the capital charges for the individual indices using a correlation matrix as follows:

$$Mkt_{eq} = \sqrt{\sum_{rxc} CorrIndex^{rxc} \bullet Mkt_r \bullet Mkt_c}$$

where

$CorrIndex^{rxc}$	=	The cells of the correlation matrix *CorrIndex*
Mkt_r, Mkt_c	=	Capital charges for equity risk per individual index according to the rows and columns of correlation matrix *CorrIndex*

and where the correlation matrix *CorrIndex* is defined as:

CorrIndex=	*Global*	*Other*
Global	1	
Other	0.75	1

TS.IX.C.18 The calculations for equity risk should be carried out under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the shocks being tested.

TS.IX.C.19 Additionally, the overall result of the calculation should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nMkt_{eq}$.

TS.IX.C.20 Simplification: Factor-based approximations for Mkt_{eq} equity risk

The determination of the capital charge $Mkt_{eq,i}$ with respect to an individual index i could be carried out by taking into account hedging and risk transfer mechanisms using a two step process.

The first step relates to the level of the individual equity. If there are hedging instruments for single equities they have to be taken into account at the level of the single equity. The hedge reduces the stress with the change in market value of the instrument itself. The impact has to be determined by the company itself.

The calculations within this first step would be carried out as follows:

For each index i the market value of individual equities allocated to i in the event of the stress scenario equity $shock_i$ would be calculated, taking into account hedging instruments[39]. The "stressed" market values would be calculated as follows:

$$Equity\_stress_{i,j} = Equity_{i,j} * (1 - volafactor_i) + Hedge_{i,j},$$

where

$Equity_{i,j}$ = Market value of the equity j allocated to index i

$Equity\_stress_{i,j}$ = Market value of $equity_{i,j}$ after stress

$Hedge_{i,j}$ = The change in Market value of hedges per individual $equity_{i,j}$ under stress

$volafactor_i$ = Prescribed volatility factor of the index i

and where the volatility factors (consistent with the specification of the scenarios equity $shock_i$) are determined as follows:

	Global	*Other*
$volafactor_i$	32%	45%

In a second step, hedging instruments for sub-portfolios e.g. indices or special funds would be taken into account. The risk mitigation would be reflected by the change in market value of the hedging instrument per index (which stands for the sub-portfolio). If there would be a global hedge for all equity positions in force, it would be allocated on a market value weighted basis to the relevant equity indices (excluding Alternative investments).

Within this second step, the changes in market value for all equities under index i would be aggregated to a capital charge taking into account hedging instruments for equity risk for the individual index i as follows:

[39] Note that in the two level process of reflecting hedging, the instrument has to be taken into account on the relevant step: single equity or index.

$$\text{ChangeInEquityValue}_i = \sum_j (\text{Equity}_{i,j} - \text{Equity\_stress}_{i,j}) - \text{Hedge}_i$$

where

ChangeInEquityValue$_i$ = Risk capital charge for equity risk for index i

Hedge$_i$ = The change in Market value of hedges per individual index i under stress

The overall value of equities under stress would be derived by combining the *ChangeInEquityValue*$_i$ for the individual indices using a correlation matrix as described above to provide *AggregateChangeInEquityValue*. This should be converted into a revised stress test and this stress test should be applied to the liabilities:

$$\text{RevisedEquityStressTest} = 1 - \frac{\text{AggregateChangeInEquityValue}}{\text{PreStressEquityValue}}$$

where

PreStressEquityValue = Current market value of all investments in equities and hedges.

PostStressLiabilityValue = Change in the value of the liabilities following a change in the value of equities/hedges of RevisedEquityStressTest.

Finally, the capital charge ($\text{Mkt}_{eq,i}$) is calculated as change in the net asset value of the undertaking as follows:

Mkteq,I = max(PostStressLiabilityValue - AggregateChangeInEquityValue,0).

Dampener Alternative for Equity Risk

TS.IX.C.21 A "dampener" formula will be tested as an alternative for QIS 4 for the "global" market equity risk component (see Annex SCR 8 – TS.XVII.J. *Alternative approach to assess the capital charge for equity risk, incorporating an equity dampener – background document provided by French authorities*).

The theoretical basis of a "dampener" is that the probability that the value of the equity indices increase is small when this value is high, and high when this value is low.

The value of an equity index is split into a trend component, and a cyclical component.

The cyclical component is the difference between the mean of the value of the equity index in the last 10 trading days before the day when the SCR is calculated and the mean of the value of the equity index in the last year (around 250 trading days) before the day when the SCR is calculated.

The dampener effect only applies to those liabilities with a duration of more than 3 years.

In this option, the calculation for $Mkt_{eq,1}$ (Capital charge for equity risk with respect to index 1(Global)) in TS.IX.C.11 is replaced by the following calculation:

Input

TS.IX.C.22 The following input information is required:

$MVEP$ = The market value of the equity portfolio (Global)[40]

k = duration of the liabilities (of more than 3 years)

α = Share of the technical provisions accounting for more than 3 year commitments

Output

TS.IX.C.23

$Mkt_{eq,1}$ = Capital charge for equity risk with respect to index 1 (Global),

$Mkt_{eq,1}$= MVEP x(α x ($F(k)+G(k)\times c_t$) + (1- α)x 32 %)

Where F(k) and G(k) are coefficients defined in the following table:

Duration of the liabilities (k)	*F(k)*	*G(k)*
3-5 years	29 %	0,20
5-10 years	26 %	0,11
10-15 years	23 %	0,08
Over 15 years	22 %	0,07

And ct is a cyclical component defined as:

- $c_t = \left(\overline{Y}_t^{10}\right) - \left(\overline{Y}_t^{261}\right)$
- $\overline{Y}_t^{10}$ is the mean of the 10 trading days before the day when the SCR is calculated
- $\overline{Y}_t^{261}$ is the mean of the last year (around 250 trading days) before the day when the SCR is calculated
- $\overline{Y}_t^{N} = \frac{\sum_{i=0}^{N-1} Ln\left(Y_{t-i}\right)}{N}$ is the mean of the last N trading days of the equity index before the day where the SCR is calculated, and $Ln(Y_t)$ the value of the natural logarithm (Ln) of the equity index Y_t at time t.

[40] Excluding the equities holdings corresponding to intragroup participations (see TS VI E)

TS.IX.C.24 The equity index to be considered for this QIS4 option is the MSCI Developed Markets index.

TS.IX.C.25 The value of c_t as of 31 December 2007 is: c_t = -0,013

TS.IX.C.26 Simplification to the Dampener approach

Undertakings may use as an approximation for the duration of their liabilities an average, weighted by the share of the technical provisions held by line of business that they write, of market average durations per line of business as specified in "National guidances".

TS.IX.C.27 Participants are invited to give their view on potential Pillar II measures for limiting the effect of procyclicality in the context of equity risk and for among others avoiding the need of forced selling of equities in stressed circumstances.

TS.IX.D. Mkt_{prop} property risk

Description

TS.IX.D.1 Property risk arises from the level or volatility of market prices of property.

Input

TS.IX.D.2 The following input information is required:

NAV	=	Net value of assets minus liabilities

Output

TS.IX.D.3 The module delivers the following output:

Mkt_{prop}	=	Capital charge for property risk[41]
$nMkt_{prop}$	=	Capital charge for property risk including the risk absorbing effect of future profit sharing

Calculation

TS.IX.D.4 The capital charge for property risk is determined as the result of a pre-defined scenario:

$$Mkt_{prop} = \Delta NAV \mid property\ shock$$

TS.IX.D.5 where the property shock is the immediate effect on the net value of asset and liabilities expected in the event of a 20% fall in real estate benchmarks, taking account of all the participant's individual direct and indirect exposures to property prices. The property shock takes account of the specific investment policy including e.g. hedging arrangements, gearing etc.

[41] Not including the potential risk absorbing effect of future profit sharing.

TS.IX.D.6 The scenario for property risk should be calculated under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the shock being tested.

TS.IX.D.7 Additionally, the result of the scenario should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nMkt_{prop}$.

TS.IX.E. Mkt_{fx} currency risk

Description

TS.IX.E.1 Currency risk arises from the level or volatility of currency exchange rates.

Input

TS.IX.E.2 The following input information is required:

NAV	=	Net value of assets minus liabilities

Output

TS.IX.E.3 The module delivers the following output:

Mkt_{fx}	=	Capital charge for currency risk[42]
Mkt_{fx}^{Up}	=	Capital charge for currency risk after an upward shock
Mkt_{fx}^{Down}	=	Capital charge for currency risk after a downward shock
$nMkt_{fx}$	=	Capital charge for currency risk including the risk absorbing effect of future profit sharing
$nMkt_{fx}^{Up}$	=	Capital charge for currency risk after an upward shock including the risk absorbing effect of future profit sharing
$nMkt_{fx}^{Down}$	=	Capital charge for currency risk after a downward shock including the risk absorbing effect of future profit sharing

Calculation

TS.IX.E.4 The capital charge for currency risk is determined as the result of two pre-defined scenarios:

$$Mkt_{p}^{U}{}_{Fx} = \Delta NAV \mid_{fx} upwardshock$$

$$Mkt_{Fx}^{Down} = \Delta NAV \mid_{fx} downwardshock$$

[42] Not including the potential risk absorbing effect of future profit sharing.

where the fx upward and downward shocks are respectively the immediate effect expected on the net value of asset and liabilities in the event of a 20% change, rise and fall respectively in value of all other currencies against the local currency in which the undertaking prepares its local regulatory accounts, taking account of all the participant's individual currency positions and its investment policy (e.g. hedging arrangements, gearing etc.).

TS.IX.E.5 The scenario for currency risk should be calculated under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the shock being tested.

TS.IX.E.6 The size of the shock applied in the calculation for an ERM II Member State currency versus the Euro should reflect the maximum fluctuations set under ERM II.[43] For QIS4 purpose, the following shock has to be considered: 2,25% for the Danish krone (DKK) and 15% for the Estonian kroon (EEK), the Latvian lats (LVL), the Lithuanian litas (LTL), and the Slovak koruna (SKK).

TS.IX.E.7 Participants applying this provision should clearly state this in the spreadsheet.

TS.IX.E.8 Additionally, the result of the scenarios should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charges are $nMkt_{fx}^{Up}$ and $nMkt_{fx}^{Down}$.

TS.IX.E.9 The capital charge for currency risk is derived from the type of shock that gives rise to the highest capital charge including the risk absorbing effect of future profit sharing:

If $nMkt_{fx}^{Up} > nMkt_{fx}^{Down}$ then $Mkt_{fx} = Mkt_{fx}^{Up}$ and $nMkt_{fx} = nMkt_{fx}^{Up}$.

If $nMkt_{fx}^{Up} \leq nMkt_{fx}^{Down}$ then $Mkt_{fx} = nMkt_{fx}^{Down}$ and $nMkt_{fx} = nMkt_{fx}^{Down}$.

TS.IX.F. Mkt_{sp} spread risk

Description

TS.IX.F.1 Spread risk is the part of risk originating from financial instruments that is explained by the volatility of credit spreads over the risk-free interest rate term structure. It reflects the change in value due to a move of the yield curve relative to the risk-free term structure. Assets which are allocated to policies where the policyholders bear the investment risk should be excluded from this risk module. However, as these policies may have embedded options and guarantees, an adjustment (calculated using a scenario-based approach) is added to the formula to take into account the part of the risk that is effectively borne by the insurer.

TS.IX.F.2 For the purposes of determining the SCR for spread risk companies should assume the more onerous (in aggregate) of a rise or fall in credit spreads. It is not required to assume different directional movements in credit spreads when determining the different components of the spread risk sub-module. Currently, default and migration risks are not explicitly built in the spread risk module. However, the spread risk module will include parts of these risks implicitly via the movements in credit spreads. The credit indices used for the calibration rebalance on a monthly basis and, consequently, the change of their constituents, due to downgrades or upgrades, has a monthly frequency as well. Hence, the impact of intra-month downgrades/upgrades will partly be reflected in the movements of credit spreads.

[43] Exchange Rate Mechanism II – see http://www.ecb.int/ecb/legal/107663/1350/html/index.en.html

TS.IX.F.3 Government bonds are exempted from an application of this module. The exemption relates to borrowings by the national government, or guaranteed by the national government, of an OECD or EEA state, issued in the currency of the government.

TS.IX.F.4 The spread risk module is applicable to all tranches of structured credit products like asset-backed securities and collateralised debt obligations. In general, these products include transactions or schemes, whereby the credit risk associated with an exposure or pool of exposures is tranched, having the following characteristics: (a) payments in the transaction or scheme are dependent upon the performance of the exposure or pool of exposures; and (b) the subordination of tranches determines the distribution of losses during the ongoing life of the transaction or scheme.

TS.IX.F.5 The spread risk module further covers credit derivatives e.g. credit default swaps (CDS), total return swaps (TRS), credit linked notes (CLN), that are not held as part of a recognised risk mitigation policy (TS.VII.H).

Input

TS.IX.F.6 The following input information is required:

$rating_i$ = the external rating of credit risk exposure i

dur_i = the modified duration of credit risk exposure i

MV_i = the credit risk exposure i as determined by reference to market values (exposure at default)

TS.IX.F.7 In cases where there is no readily-available market value of credit risk exposure i, alternative approaches consistent with relevant market information might be adopted to determine MV_i. In cases where several ratings are available for a given credit exposure, generally the second-best rating should be applied.

Output

TS.IX.F.8 The module delivers the following output:

Mkt_{sp} = Capital charge for spread risk

$nMkt_{sp}$ = Capital charge for spread risk including the risk absorbing effect of future profit sharing

Calculation

TS.IX.F.9 The capital charge for spread risk is determined as follows:

$$Mkt_{sp} = Mkt_{sp}^{bonds} + Mkt_{sp}^{struct} + Mkt_{sp}^{cd}$$

Where:

Mkt_{sp}^{bonds} is the capital charge for spread risk of bonds

Mkt_{sp}^{struct} is the capital charge for spread risk of structured credit products

Mkt_{sp}^{cd} is the capital charge for credit derivatives

TS.IX.F.10 The capital charge for spread risk of bonds is determined as follows:

$$Mkt_{sp} = \sum_i MV_i \bullet m(dur_i) \bullet F(rating_i) + \Delta Liab_{ul} \ ,$$

where

$F(rating_i)$ = a function of the rating class of the credit risk exposure which is calibrated to deliver a shock consistent with VaR 99.5%

$m(dur_i)$ = a function of the duration of the credit exposure

$\Delta Liab_{ul}$ = the overall impact on the liability side for policies where the policyholders bear the investment risk with embedded options and guarantees of the stressed scenario, with a minimum value of 0 (sign convention: positive sign means losses). The stressed scenario is defined as a drop in value on the assets (except government bonds referred to in TS.IX.F3 used as the reference to the valuation of the liabilities by $m(dur_i)$ * $F(rating_i)$ (e.g. for an asset BBB-rated with duration of 4 years this means a drop by 5%)

TS.IX.F.11 The capital charge for spread risk of structured credit products is determined as follows:

$$Mkt_{sp}^{struct} = \sum_i MV_i \bullet n(dur_i) \bullet G(rating_i) \ ,$$

where

$G(rating_i)$ = a function of the rating class of the credit risk exposure which is calibrated to deliver a shock consistent with VaR 99.5%

$n(dur_i)$ = a function of the duration of the credit exposure

TS.IX.F.12 The function F and G are determined as follows:

$Rating_i$	$F(Rating_i)$	$G(Rating_i)$
AAA	0.25%	2.13%
AA	0.25%	2.55%
A	1.03%	2.91%
BBB	1.25%	4.11%
BB	3.39%	8.42%
B	5.60%	13.35%
CCC or lower	11.20%	29.71%
Unrated[44]	2.00%	100.00%

TS.IX.F.13 The function m is determined as follows:

$$m(dur_i) = \begin{cases} \max(\min(dur_i;8);1) & \text{if rating}_i = \text{BB} \\ \max(\min(dur_i;6);1) & \text{if rating}_i = \text{B} \\ \max(\min(dur_i;4);1) & \text{if rating}_i = \text{CCC or lower, unrated} \\ \max(dur_i;1) & \text{otherwise} \end{cases}$$

Similarly, a look-through approach should be applied to assets representing reinsurers' funds withheld by a counterparty.

TS.IX.F.14 The function n is determined as follows:

$$n(dur_i) = \begin{cases} \max(\min(dur_i;5);1) & \text{if rating}_i = \text{BB} \\ \max(\min(dur_i;4);1) & \text{if rating}_i = \text{B} \\ \max(\min(dur_i;2.5);1) & \text{if rating}_i = \text{CCC or lower} \\ 1 & \text{if unrated} \\ \max(dur_i;1) & \text{otherwise} \end{cases}$$

TS.IX.F.15 For collateralised debt obligations companies should ensure that the rating reflects the nature of the underlying risks associated with collateral assets. For example, in the case of a CDO-squared, the rating should take into account the risks associated with the CDO tranches held as collateral, i.e. the extent of their leveraging and the risks associated with the collateral assets of these CDO tranches.

TS.IX.F.16 For credit derivatives, the capital charge Mkt_{sp}^{cd} is determined as the change in the value of the derivative (i.e. as the decrease in the asset or the increase in the liability) that would occur following (a) a widening of credit spreads by 300% if overall this is more

[44] For an unrated 5-year maturity corporate bond the 2% risk weight approximately corresponds to the 8% CRD charge.

onerous, or (b) a narrowing of credit spreads by 75% if this is more onerous (See TS.IX.F.2). A notional capital charge should then be calculated for each event. The capital charge for derivatives should then be the higher of these two notional charges.

TS.IX.F.17 The calculation of the capital charge for spread risk should be derived under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after a presumed change in spread levels.

TS.IX.F.18 Additionally, the result of the calculation should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nMkt_{sp}$. On assessing the scope of variation of the assumptions on future bonus rates firms should have regard to the size of shock (as measured by the amount of the spread risk charge) and of the resulting financial position, and then reflect on what would be a realistic level of reduction of future bonuses (subject to any legal or contractual constraints) as a trade-off between improvement of the solvency position, managing policyholders expectations and deteriorating commercial objectives.

TS.IX.F.19 Simplification

The following simplification may be used provided:

(a) The average credit rating for long duration bonds (10 year and above) is not less than one rating below the credit rating for short duration bonds (5 years or below).

(b) The general criteria for simplifications are followed.

For bonds: $Mkt_{sp}^{bonds} = MV * Dur^{bonds} * \Sigma (\%Mv_i^{bonds} F(rating_i)) + \Delta Liab_{ul}$

For structured credit products: $Mkt_{sp}^{struct} = MV * Dur^{struct} * \Sigma (\%Mv_i^{struct} G(rating_i))$

For credit derivatives: $Mkt_{sp}^{cd} = \Sigma (Mv_i^{cd}) * Dur^{cd}$

$Mkt_{sp} = Mkt_{sp}^{bonds} + Mkt_{sp}^{struct} + Mkt_{sp}^{cd}$

where:

MV = Total market value of non-government bond portfolio

Dur^{bonds} = Modified duration of non-government bond portfolio

Dur^{struct} = Modified duration of structured credit portfolio

Dur^{cd} = Modified duration of credit derivatives portfolio

$\%Mv_i^{bonds}$ = Proportion of non-government bond portfolio held at rating i

$\%Mv_i^{struct}$ = Proportion of structured credit portfolio held at rating i

$\%Mv_i^{cd}$ = Proportion of credit derivatives portfolio held at rating i

Where $\Delta Liab_{ul}$ = the overall impact on the liability side for policies where the policyholders bear the investment risk with embedded options and guarantees of the

stressed scenario, with a minimum value of 0 (sign convention: positive sign means losses). The stressed scenario is defined as a drop in value on the assets (except government bonds referred in TS.IX.F.3) used as the reference to the valuation of the liabilities by MV * Dur^{bonds} * Σ ($\%Mv_i^{bonds}$ F$(rating_i)$)

F$(rating_i)$: as for non-simplified approach

G$(rating_i)$: as for non-simplified approach

TS.IX.G. Mkt_{conc} *market risk concentrations*

Description

TS.IX.G.1 Market risk concentrations present an additional risk to an insurer because of:

- additional volatility that exists in concentrated asset portfolios; and
- the additional risk of partial or total permanent losses of value due to the default of an issuer

Assets which are allocated to policies where the policyholders bear the investment risk should be excluded from this risk module. However, as these policies may have embedded options and guarantees, an adjustment (calculated using a scenario-based approach) is added to the formula to take into account the part of the risk that is effectively borne by the insurer.

TS.IX.G.2 For the sake of simplicity and consistency, the definition of market risk concentrations is restricted to the risk regarding the accumulation of exposures with the same counterparty. It does not include other types of concentrations (e.g. geographical area, industry sector etc.).

TS.IX.G.3 In case an undertaking owns shares representing more than 20% of the capital of another insurance or financial undertaking which: 1) is not included in the scope of consolidation or supplementary supervision and 2) where the value of that participation or subsidiary exceeds 10% of the participating undertaking's own funds, these shares are exempted from the application the concentration risk module when using option 1 described in Annex SCR 1 – TS.XVII.C for the treatment of participations (deduction-aggregation method). In line with this approach, when using option 3 described in the Annex for the treatment of participations (look-through approach), the concentration risk module should not be applied.

TS.IX.G.4 Government bonds are exempted from the application of this module. The exemption concerns borrowings by the national government, or guaranteed by the national government, of an OECD or EEA state, issued in the currency of the government.

Bank deposits with a term of less than 3 months terms, of up to 3 million Euros, in a bank that has a minimum credit rating of AA are also exempted from an application of this module.

Input

TS.IX.G.5 Risk exposures in assets need to be grouped according to the counterparties involved.

E_i = Net exposure at default to counterparty i

$Assets_{xl}$ = Amount of total assets excluding those where the policyholder bears the investment risk

$rating_i$ = External rating of the counterparty i

Where an undertaking has more than one exposure to a counterparty then E_i is the aggregate of those exposures at default and $rating_i$ should be a weighted rating determined as the rating (in the table in TS.IX.G.12) corresponding to a weighted average credit quality step calculated as

Weighted average credit quality step	=	round (average of the credit quality steps of the individual exposures to that counterparty, weighted by the net exposure at default in respect of that exposure to that counterparty)

TS.IX.G.6 All entities which belong to the same group should be considered as a single counterparty for the purposes of this sub-module.

TS.IX.G.7 The net exposure at default to an individual counterparty i shall comprise the asset classes of equity and fixed income (including hybrid instruments, e.g. junior debt, mezzanine CDO tranches …).

TS.IX.G.8 Financial derivatives on equity and defaultable bonds should be properly attributed (via their 'delta') to the net exposure, i.e. an equity put option reduces the equity exposure to the underlying 'name' and a single-name CDS ('protection bought') reduces the fixed-income exposure to the underlying 'name'. The exposure to the default of the counterparty of the option or the CDS is not treated in this module, but in the counterparty default risk module. Also, collaterals securitising bonds should be taken into account. Similarly, a look-through approach should be applied to assets representing reinsurers' funds withheld by a counterparty.

TS.IX.G.9 Exposures via investment funds or such entities whose activity is mainly the holding and management of an insurer's own investment need to be considered on a look-through basis. The same holds for CDO tranches and similar investments embedded in 'structured products'.

Output

TS.IX.G.10 The module delivers the following output:

Mkt_{conc}	=	Capital charge for market concentration risk
$nMkt_{conc}$	=	Capital charge for concentration risk including the risk absorbing effect of future profit sharing

Calculation

TS.IX.G.11 The calculation is performed in three steps: (a) excess exposure, (b) risk concentration charge per 'name', (c) aggregation.

The excess exposure is calculated as:

$$XS_i = \max\left\{0; \frac{E_i}{Assets_{xl}} - CT\right\},$$

where the concentration threshold CT, depending on the rating of counterparty i, is set as follows[45] [46]:

$rating_i$	CT
AA-AAA	5%
A	5%
BBB	3%
BB or lower	3%

TS.IX.G.12 The risk concentration charge per 'name' i is calculated as:

$$Conc_i = Assets_{xl} \bullet XS_i \bullet g_i + \Delta Liab_{ul}$$

where XS_i is expressed with reference to the unit (i.e. an excess of exposure i above the threshold of 8%, delivers $XS_i = 0.08$) and the parameter g , depending on the credit rating of the counterparty, is determined as follows:

$rating_i$	Credit Quality Step	g_i
AAA	1	0.15
AA		
A	2	0.18
BBB	3	0.30
BB or lower, unrated	4 – 6, -	0.73

and where

$\Delta Liab_{ul}$ = the overall impact on the liability side for policies where the policyholders bear the investment risk with embedded options and guarantees of the stressed scenario, with a minimum value of 0 (sign convention: positive sign means losses). The stressed scenario is defined as a drop in value on the assets for counterparty i used as the reference to the valuation of the liabilities by $XS_i * g_i$.

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[45] Note that a concentration threshold of e.g. 5% means that at most 20 of the largest risk concentrations need to be considered for the purposes of this module.

[46] For the calculation of the concentration risk, a specificity of the Danish market has come up, that would justify a specific treatment. In the case of exposures to certain debt securities the concentration threshold CT should be set at 40%. To qualify for this treatment, such securities have to be issued by a credit institution which has its head office in a Member State and is subject by law to special official supervision designed to protect the holders of those debt securities. In particular, sums deriving from the issue of such debt securities must in accordance with the law be invested in assets which, during the whole period of validity of the debt securities, are capable of covering claims attached to debt securities and which, in the event of failure of the issuer, would be used on a priority basis for the reimbursement of the principal and payment of the accrued interest. The rationale for this different treatment can be found in the current investment diversification rules as laid down in Directive 2002/83/EC article 24 (4), where securities as described are subject to a limit of 40 % instead of 5 %, which reflects the more secure nature of such securities. For more information, see Annex SCR 1 - TS.XVII.F.

For “names” which can only be found on the assets used as the reference to the valuation of the liabilities, the risk concentration charge per name ‘i’ is calculated as follows: $Conc_i = \Delta Liab_{ul,i}$

TS.IX.G.13 The total capital requirement for market risk concentrations is determined assuming independence between the requirements for each counterparty i:

$$Mkt_{conc} = \sqrt{\sum_i Conc_i^2} \ .$$

TS.IX.G.14 This capital charge is calculated for concentration risk under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after a presumed change in volatility and/or default level of concentrated assets.

TS.IX.G.15 Additionally, the result of the calculation should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nMkt_{conc}$.

TS.X. SCR Counterparty risk module

TS.X.A. SCR_{def} counterparty default risk

Description

TS.X.A.1 Counterparty default risk is the risk of possible losses due to unexpected default, or deterioration in the credit standing of the counterparties or debtors in relation to risk mitigating contracts, such as reinsurance arrangements, securitisations and derivatives, and receivables from intermediaries, as well as any other credit exposures which are not covered in the spread risk sub-module.

For each counterparty, the counterparty default risk module shall take account of the overall counterparty risk exposure of the insurance or reinsurance undertaking concerned to that counterparty, irrespective of the legal form of its contractual obligations to that undertaking.

TS.X.A.2 The main inputs of the counterparty default risk module are the estimated loss-given-default (LGD) of an exposure and the probability of default (PD) of the counterparty.

LGD_i = Loss-given-default of reinsurance, financial derivatives, intermediary, or any other credit exposures if counterparty *i* defaults.

PD_i = Probability of default of counterparty *i*.

TS.X.A.3 In relation to a counterparty of reinsurance contracts (or an SPV), the loss given default is defined as follows:

LGD = 50% max (Recoverables + $SCR_{U/W}^{gross} - SCR_{U/W}^{net}$ - Collateral; 0),

where

Recoverables[47] = Best estimate of recoverables from the reinsurance contract (or SPV) as defined in TS.II.B.21-31

$SCR_{U/W}^{net}$ = SCR for underwriting risks calculated according to the standard formula (disregarding the loss absorbing capacity of future bonuses and deferred taxes)

$SCR_{U/W}^{gross}$ = SCR calculated according to the standard formula, but disregarding the risk mitigating effect of the reinsurance contract (or SPVs) of the counterparty (and disregarding the loss absorbing capacity of future bonuses

[47] Recoverables should allow for the expected counterparty default to avoid double counting.

and deferred taxes)

Collateral = Collateral covering the loss in relation to the counterparty

A collateral should not be taken into account in the above calculation if it is held by the counterparty itself. If the collateral bears any default risk, it should be included in the module calculation like receivables from intermediaries and other credit exposures.

TS.X.A.4 The factor of 50% takes into account the fact that even in case of default the reinsurer will usually be able to meet a larger part of its obligations[48].

TS.X.A.5 The risk mitigation effect of the reinsurance contract can be left out of the calculations of the underwriting risk modules as specified in the following table:

SCR sub-module	how to disregard mitigating effect
non-life premium and reserve risk (and similar modules of short term health underwriting risk and workers compensation underwriting risk)	• disallowance of reinsurance premium from the treaty in the volume measure for premium risk (i.e. net premium is increased) • disallowance of recoverables from the treaty in the volume measure for reserve risk (i.e. net technical provision is increased)
non-life CAT risk	disallowance of mitigating effect of the treaty in the CAT scenarios
life underwriting risks	disallowance of mitigating effect of the treaty in the adverse scenarios
Long-term health underwriting risks	no change (module does not take reinsurance into account)

TS.X.A.6 In relation to a counterparty of financial derivatives, the loss given default is defined as follows:

$$LGD = 50\% \max\left(\text{Market value} + SCR_{Mkt}^{gross} - SCR_{Mkt}^{net} - \text{Collateral}; 0\right)$$

where

Market value = value of the financial derivative as defined in Article 74 of the proposal for a Framework Directive

[48] 50% is a conservative choice. Compare the analysis of loss given default in Standard & Poor's, Annual 2005 Global Corporate Default Study And Rating Transitions, January 2006, or in Fitch Ratings, Prism: Favorable Market Feedback and Clarifying Responses – Part 1, September 2006.

SCR_{Mkt}^{net} = the SCR calculated according to the standard formula (disregarding the loss absorbing capacity of future bonuses and deferred taxes)

SCR_{Mkt}^{gross} = the SCR calculated according to the standard formula, but disregarding the risk mitigating effect of the financial derivatives of the counterparty (and disregarding the loss absorbing capacity of future bonuses and deferred taxes)

Collateral = Collateral covering the loss in relation to the counterparty

A collateral should not be taken into account in the above calculation if it is held by the counterparty itself. If the collateral bears any default risk, it should be included in the module calculation like receivables from intermediaries and other credit exposures.

TS.X.A.7 The risk mitigating effect of the financial derivative can be left out of the calculations of the market module as specified in the following table:

SCR sub-module	how to disregard the mitigating effect
interest rate risk, equity risk, property risk, non-life premium and reserve risk	disallowance of mitigating effect of the derivative in the adverse scenarios (regarding interest rate risk, the choice of the scenario – up or down - should not change)
spread risk	no change (sub-module does not take derivatives into account)
concentration risk	disallowance of mitigating effect of the derivative in the determination of the exposure (see TS.IX.G.8)

TS.X.A.8 In relation to the intermediary risk and any other credit exposures, the loss given default is the best estimate of the credit to intermediaries and any other credit exposures respectively.

The overall loss-given default LGD_i in relation to a counterparty i is the sum of the losses-given-default for reinsurance and SPVs, financial derivatives, and intermediary risk and other credit exposures.

TS.X.A.9 A PD estimate is derived from external ratings according to the following table:

$Rating_i$	Credit Quality Step	PD_i
AAA	1	0.002%
AA		0.01%
A	2	0.05%
BBB	3	0.24%
BB	4	1.20%
B	5	6.04%
CCC or lower, unrated	6, -	30.41%

TS.X.A.10 The rating scale used by Standard & Poor's is given for illustrative purposes. In cases where several ratings are available for a given credit exposure, the second-best rating should be applied.

TS.X.A.11 Unrated insurers and reinsurers not subject to Solvency II regulation would be treated as rating class 6 (CCC). Unrated insurers and reinsurers subject to Solvency II regulation would be treated as rating class 3 (BBB).

Output

TS.X.A.12 The module delivers the following output:

SCR_{def}	=	Capital charge for counterparty default risk
$nSCR_{def}$	=	Capital charge for counterparty default risk including the risk absorbing effect of future profit sharing

Calculation

TS.X.A.13 Three steps are performed: (a) calculation of the concentration in reinsurance, financial derivatives, receivables from intermediaries, as well as any other credit exposures via the Herfindahl index, (b) calculation of capital requirements per counterparty and (c) aggregation.

TS.X.A.14 The Herfindahl index for reinsurance exposure is computed as

$$H = \frac{\sum_{i \in \mathrm{Re}} LGD_i^2}{\left(\sum_{i \in \mathrm{Re}} LGD_i \right)^2}$$

where the sum is taken over all reinsurance counterparties. The Herfindahl index H_{fd}, H_{int}, H_{oce} for the financial derivative exposures, the receivables from intermediaries, as well as any other credit exposures are computed in the same way, over all counterparties classified in the same category.

TS.X.A.15 The implicit correlation for counterparty default is calculated as:

R= 0.5 + 0.5.H.

TS.X.A.16 The counterparty default risk requirement Def_i for an exposure i is determined as follows, depending on the implicit correlation R:

- For an implicit correlation R of less than 1, the determination of Def_i is based on the Vasicek distribution:

$$Def_i = LGD_i \bullet N\left[(1-R)^{-0.5} \bullet G(PD_i) + \sqrt{\frac{R}{1-R}} \bullet G(0.995)\right]$$

where

N = the cumulative distribution function for the standard normal random variable

G = the inverse of the cumulative distribution function for the standard normal random variable

- for an implicit correlation R of 1, Def_i is determined as follows:

$$Def_i = LGD_i \bullet \min(100 \bullet PD_i ; 1)$$

TS.X.A.17 Individual capital charges Def_i are added up for reinsurance exposures financial derivatives, receivables from intermediaries, as well as any other credit exposures to get the capital requirement for counterparty credit risk, SCR_{def}.

TS.X.A.18 In case of reinsurance ceded to an unrated reinsurer (i) part of the same group (internal reinsurance), the probability of default of counterparty i is replaced , for the share of the reinsurance that is retroceded outside the group to a counterparty k by the probability of default of counterparty k. In this case the probability of default of counterparty i will still be used for the share of the reinsurance kept in retention by reinsurer i.

TS.X.A.19 For intragroup reinsurance which does not meet the requirements specified in the previous paragraph, a regulatory rating should be used to determine the probability of default of the intragroup counterparty. The probability of default depends on the solvency ratio (ratio of own funds and SCR) according to the following table:

Counterparty solvency ratio	PD_i
> 200%	0.002%
> 160%	0.01%
> 130%	0.05%

> 100%	0.24%
> 70%	1.20%
> 50%	6.04%
≤ 50%	30.41%

TS.X.A.20 The calculation of the capital charge for counterparty default risk should be derived under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after a presumed change in default counterparty to risk mitigating contracts like reinsurance and financial derivatives.

TS.X.A.21 Additionally, the result of the calculation should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nSCR_{def}$.

TS.X.A.22 Simplification

If it is proportionate to the underlying risk, participants may determine the loss-given default LGD_i and the requirements Def_i on the level of rating classes rather than on the level of counterparties.

TS.XI. SCR Life underwriting risk module

TS.XI.A. SCR_{life} life underwriting risk module

Description

TS.XI.A.1 This module concerns the risk arising from the underwriting of life insurance contracts, associated with both the perils covered and the processes followed in the conduct of the business.

TS.XI.A.2 Life underwriting risk is split into biometric risks (comprising mortality risk, longevity risk and disability/morbidity risk), lapse risk, expense risk, revision risk and catastrophe risk.

TS.XI.A.3 Based on the principle of substance over form, set out in paragraph TS.VI.A.3, agreed claims arising from non-life business payable in the form of an annuity should normally be part of SCR_{life} (subject to materiality considerations). In particular, the risk of revision is applicable only to this type of annuities.

Input

TS.XI.A.4 The following input information is required[49]:

$Life_{rev}$ = Capital charge for revision risk

$Life_{mort}$ = Capital charge for mortality risk

$Life_{long}$ = Capital charge for longevity risk

$Life_{dis}$ = Capital charge for disability[50] risk

$Life_{lapse}$ = Capital charge for lapse risk

$Life_{exp}$ = Capital charge for expense risk

$Life_{CAT}$ = Capital charge for catastrophe risk

$nLife_{mort}$ = Capital charge for mortality risk including the risk absorbing effect of future profit sharing

$nLife_{long}$ = Capital charge for longevity risk including the risk absorbing effect of future profit sharing

$nLife_{dis}$ = Capital charge for disability risk including the risk absorbing effect of future profit sharing

$nLife_{lapse}$ = Capital charge for lapse risk including the risk absorbing effect of future profit sharing

$nLife_{exp}$ = Capital charge for expense risk including the risk absorbing

[49] Except for the sub-module revision risk the capital charges Life do not include the potential risk absorbing effect of future profit sharing.

[50] Disability risk is defined to include both disability risk and morbidity (or sickness) risk.

effect of future profit sharing

$nLife_{CAT}$ = Capital charge for catastrophe risk including the risk absorbing effect of future profit sharing

Output

TS.XI.A.5 The module delivers the following output:

SCR_{life} = Capital charge for life underwriting risk[51]

$nSCR_{life}$ = Capital charge for life underwriting risk including the risk absorbing effect of future profit sharing

Calculation

TS.XI.A.6 The capital charge for life underwriting risk is derived by combining the capital charges for the life sub-risks using a correlation matrix as follows:

$$SCR_{life} = \sqrt{\sum_{rxc} CorrLife^{rxc} \bullet Life_r \bullet Life_c}$$

where

SCR_{life} = Capital charge for life underwriting risk

$CorrLife^{rxc}$ = the cells of the correlation matrix *CorrLife*

$Life_r$, $Life_c$ = Capital charges for individual life underwriting sub-risks according to the rows and columns of correlation matrix *CorrLife*

and where the correlation matrix *CorrLife* is defined as:

CorrLife	$Life_{mort}$	$Life_{long}$	$Life_{dis}$	$Life_{lapse}$	$Life_{exp}$	$Life_{rev}$	$Life_{CAT}$
$Life_{mort}$	1						
$Life_{long}$	-0.25	1					
$Life_{dis}$	0.5	0	1				
$Life_{lapse}$	0	0.25	0	1			
$Life_{exp}$	0.25	0.25	0.5	0.5	1		
$Life_{rev}$	0	0.25	0	0	0.25	1	
$Life_{CAT}$	0	0	0	0	0	0	1

[51] Not including the potential risk absorbing effect of future profit sharing.

TS.XI.A.7 The capital charge for $nSCR_{life}$ is determined as follows:

$$nSCR_{life} = \sqrt{\sum_{rxc} CorrLife_{r,c} \cdot nLife_r \cdot nLife_c}$$

where $nLife_{rev}$ is defined to be $Life_{rev}$

TS.XI.B. $Life_{mort}$ *mortality risk*

Description

TS.XI.B.1 Mortality risk is intended to reflect the uncertainty in trends and parameters, to the extent these are not already reflected in the valuation of technical provisions.

TS.XI.B.2 It is applicable to the insurance contracts contingent on mortality risk (i.e. where the amount currently payable on death exceeds the technical provisions held, and therefore an increase in mortality rates is likely to lead to an increase in technical provisions).

TS.XI.B.3 For those contracts that provide benefits both in case of death and survival, one of the following two options should be chosen and applied consistently to all contracts in the various lines of business concerned:

- Option 1: Contracts where the death and survival benefits are contingent on the life of the same insured person(s)[52] should not be unbundled[53]. For these contracts the mortality scenario should be applied fully allowing for the netting effect provided by the 'natural' hedge between the death benefits component and the survival benefits component (note that a floor of zero applies at the level of contract if the net result of the scenario is favourable to the (re)insurer).

- Option 2: All contracts are unbundled into 2 separate components: one contingent on the death and other contingent on the survival of the insured person(s). Only the former component is taken into account for the application of the mortality scenario.

TS.XI.B.4 Participants are asked to identify the option chosen and the underlying reasons.

Input

TS.XI.B.5 No specific input data is required for this module.

Output

TS.XI.B.6 The module delivers the following output:

$Life_{mort}$ = Capital charge for mortality risk[54]

$nLife_{mort}$ = Capital charge for mortality risk including the risk absorbing effect of future profit sharing

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[52] This can be relaxed to include persons that are considered to belong to the same cohort, i.e. same relative age and health conditions.

[53] For all the remaining contracts, unbundling is required (i.e. option 2 is applicable).

[54] Not including the potential risk absorbing effect of future profit sharing

Calculation

TS.XI.B.7 The capital charge for mortality risk is defined as the result of a life mortality scenario defined as follows:

$$Life_{mort} = \sum_{i} \left(\Delta NAV \mid mortshock \right)$$

where the subscript i denotes each policy where the payment of benefits (either lump sum or multiple payments) is contingent on mortality risk. The other terms represent

ΔNAV	=	The change in the net value of assets minus liabilities [55]
mortshock	=	A (permanent) 10% increase in mortality rates for each age

TS.XI.B.8 The life mortality scenario should be calculated under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the shocks being tested.

TS.XI.B.9 Additionally, the result of the scenario should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nLife_{mort}$.

TS.XI.B.10 Simplification:

The following simplification may be used provided:

(a) There is no significant change in the capital at risk over the policy term of the contract.

(b) The general criteria for simplifications are followed.

Mortality capital requirement = (Total capital at risk) * q(firm-specific) * n * 0.10 * (Projected Mortality Increase)

where:

n = modified duration of liability cash-flows

q = Expected average death rate over the next year weighted by sum assured

Projected Mortality Increase = $1.1^{((n-1)/2)}$

[55] Undertakings should apply the principles in Section 1 of the specification regarding assumed policyholder behaviour, when assessing the value of the liabilities following the mortality shock.

TS.XI.C. $Life_{long}$ longevity risk

Description

TS.XI.C.1 Longevity risk is intended to reflect the uncertainty in trends and parameters, to the extent these are not already reflected in the valuation of technical provisions.

TS.XI.C.2 It is applicable to the class of insurance contracts contingent on longevity risk (i.e. where there is no death benefit, or where the amount currently payable on death is less than the technical provisions held, and therefore a decrease in mortality rates is likely to lead to an increase in technical provisions)[56].

TS.XI.C.3 For those contracts that provide benefits both in case of death and survival, the procedure set in the corresponding "mortality risk" paragraphs TS.XI.B.3 concerning mortality risk should be applied in an analogous and consistent manner.

Input

TS.XI.C.4 No specific input data is required for this module.

Output

TS.XI.C.5 The module delivers the following output:

$Life_{long}$	=	Capital charge for longevity risk[57]
$nLife_{long}$	=	Capital charge for longevity risk including the risk absorbing effect of future profit sharing

Calculation

TS.XI.C.6 The capital charge for longevity risk is defined as a result of a longevity scenario as follows:

$$Life_{long} = \sum_i \left(\Delta NAV \,|\, longevityshock\right))$$

where the subscript i denotes each policy where the payment of benefits (either lump sum or multiple payments) is contingent on longevity risk. The other terms represent

ΔNAV	=	The change in the net value of assets minus liabilities[58]
$longevityshock$	=	a (permanent) 25% decrease in mortality rates for each age

[56] The provision for disability claims in payment should be included within the longevity risk module.

[57] Not including the potential risk absorbing effect of future profit sharing.

[58] Undertakings should apply the principles in TS.II.D.11 to 15 of the specification regarding assumed policyholder behaviour when assessing the value of the liabilities following the longevity shock.

TS.XI.C.7 The life longevity scenario should be calculated under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the shocks being tested.

TS.XI.C.8 Additionally, the result of the scenario should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nLife_{long}$.

TS.XI.C.9 Simplification:

The following simplification may be used provided: a) The average age of policyholders within the portfolio is 60 years or over. b) The general criteria for simplifications are followed. Longevity capital requirement = 25% * q *$(1.1)^{((n-1)/2)}$ * n * (Technical provisions for contracts subject to longevity risk) where: n = modified duration of liability cash-flows q = Expected average death rate over the next year weighted by sum assured

TS.XI.D. $Life_{dis}$ disability risk[59]

Description

TS.XI.D.1 The treatment of disability risk is intended to reflect uncertainty risk in trends and parameters, to the extent these are not already reflected in the valuation of technical provisions.

TS.XI.D.2 It is applicable to the class of insurance contracts where benefits are payable contingent on a definition of disability[60].

Input

TS.XI.D.3 No specific input data is required for this module.

Output

TS.XI.D.4 The module delivers the following output:

$Life_{dis}$ = Capital charge for disability risk[61]

$nLife_{dis}$ = Capital charge for disability risk including the risk

[59] Altenatively, participants may calculate the capital charge for life disability risk following the "UK alternative disability risk sub-module" specifications (TS.XVIII.11: Annex SCR6).

[60] Disability also includes morbidity or sickness, i.e. policies with (lump sum or annual) benefits that are payable contingent on some definition of sickness.

[61] Not including the potential risk absorbing effect of future profit sharing.

absorbing effect of future profit sharing

Calculation

TS.XI.D.5 The capital charge for disability risk is defined as the result of a disability scenario as follows:

$$Life_{dis} = \sum_i \left(\Delta NAV \mid disshock \right)$$

where the subscript i denotes each policy where the payment of benefits (either lump sum or multiple payments) is contingent on disability risk. The other terms represent

ΔNAV	=	Change in the net value of assets minus liabilities[62]
Disshock	=	Increase of 35% in disability rates for the next year, together with a (permanent) 25% increase (over best estimate) in disability rates at each age in following years

TS.XI.D.6 The life disability scenarios should be calculated under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the shocks being tested.

TS.XI.D.7 Additionally, the result of the scenario should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nLife_{dis}$.

TS.XI.D.8 Simplification:

The following simplification may be used provided:

a) There is no significant change in the capital at risk over the policy term of the contracts.

b) The general criteria for simplifications are followed.

Disability capital requirement = (total disability sum at risk) * i(firm-specific) * 0.35 * (Projected Disability Increase) * n

where:

n = Modified duration of liability cash-flows

i = Expected movements from healthy to sick over the next year weighted by sum assured/annual payment

Projected Disability Increase = $1.1^{((n-1)/2)}$

[62] Undertakings should apply the principles in Section 1 of the specification regarding assumed policyholder behaviour when assessing the value of the liabilities following the disability shock.

TS.XI.E. $Life_{lapse}$ lapse risk

Description

TS.XI.E.1 Lapse risk relates to the loss, or adverse change in the value of insurance liabilities, resulting from changes in the level or volatility of the rates of policy lapses, terminations, changes to paid-up status (cessation of premium payment) and surrenders. The standard formula allows for the risk of a permanent change of the rates as well as for the risk of a mass lapse event.

Output

TS.XI.E.2 The module delivers the following output:

$Life_{lapse}$	=	Capital charge for lapse risk (not including the risk absorbing effect of future profit sharing)
$nLife_{lapse}$	=	Capital charge for lapse risk including the risk absorbing effect of future profit sharing

Calculation

TS.XI.E.3 The capital charge for lapse risk is defined as follows:

$$Life_{lapse} = \max(Lapse_{down}; Lapse_{up}; Lapse_{mass})$$

where

$Lapse_{down}$	=	Capital charge for the risk of a permanent decrease of rates of lapsation
$Lapse_{up}$	=	Capital charge for the risk of a permanent increase of rates of lapsation
$Lapse_{mass}$	=	Capital charge for the risk of a mass lapse event

TS.XI.E.4 Capital charges are calculated based on a policy-by-policy comparison of surrender value and best estimate provision. The surrender strain of a policy is defined as the difference between the amount currently payable on surrender and the best estimate provision held. The amount payable on surrender should be calculated net of any amounts recoverable from policyholders or agents e.g. net of any surrender charge that may be applied under the terms of the contract.

$$Lapse_{down} = \sum_i \left(\Delta NAV \mid lapseshock_{down}\right)$$

where i denotes each policy.

TS.XI.E.5 The other terms represent

ΔNAV	=	Change in the net value of assets minus liabilities (not including the loss-absorbing effect of future discretionary benefits and taxation)
$lapseshock_{down}$	=	Reduction of 50% in the assumed rates of lapsation in all future years for policies where the surrender strain is expected to be negative

$$Lapse_{up} = \sum_i \left(\Delta NAV \mid lapseshock_{up}\right)$$

where i denotes each policy.

TS.XI.E.6 The other terms represent

ΔNAV	=	Change in the net value of assets minus liabilities (not including the loss-absorbing effect of future discretionary benefits and taxation)
$lapseshock_{up}$	=	Increase by 50% in the assumed rates of lapsation in all future years for policies where the surrender value is expected to be positive

TS.XI.E.7 $Lapse_{mass}$ is defined as 30% of the sum of surrender strains over the policies where the surrender strain is positive. The result reflects the loss which is incurred in a mass lapse event.

TS.XI.E.8 In order to determine $nLife_{lapse}$, the results of the scenarios should also be calculated under the condition that the undertaking is able to vary its assumptions on future bonus rates in response to the shock being tested.

TS.XI.E.9 If the scenario that gives the maximum net calculation does not coincide with the scenario that gives the maximum gross calculation, the definition of $Life_{lapse}$ should be changed in order to ensure consistency with the net calculation. For instance, if $Lapse_{down}$=10, $Lapse_{up}$=20, $Lapse_{mass}$=*30*, $nLapse_{down}$=9, $nLapse_{up}$=5 and $nLapse_{mass}$=*8*, then $Life_{lapse}$ should be chosen to be 10 but not 30.

TS.XI.E.10 Simplifications

If it is proportionate to the nature, scale and complexity of the risk, the comparison of surrender value and best estimate provision in the above calculations may be made on the level of homogeneous risk groups (or at finer granularity) instead of a policy-by-policy basis. In particular, if the conditions are met this simplification may be applied if technical provisions are not calculated on a policy-by-policy basis (see TS.II.D.9)

A simplified calculation of $Lapse_{down}$ and $Lapse_{up}$ may be made if the following conditions are met:

(a) The simplified calculation is proportionate to nature, scale and complexity of the risk.

(b) The undertaking is small or the capital charge for lapse risk under the simplified calculation is less than 5% of the overall SCR before adjustment for the loss-absorbing capacity of technical provisions.

The simplified calculations are defined as follows:

$$Lapse_{down} = 0.5 \cdot l_{down} \cdot n_{down} \cdot S_{down}$$

and

$$Lapse_{up} = 1.5 \cdot l_{up} \cdot n_{up} \cdot S_{up} \ ,$$

where

$l_{down}; l_{up}$ = estimate of the average rate of lapsation of the policies with a negative/positive surrender strain

$n_{down}; n_{up}$ = average period (in years), weighted by surrender strains, over which the policy with a negative/positive surrender strain runs off

$S_{down}; S_{up}$ = sum of negative/positive surrender strains

TS.XI.F. $Life_{exp}$ expense risk

Description

TS.XI.F.1 Expense risk arises from the variation in the expenses incurred in servicing insurance or reinsurance contracts.

Output

TS.XI.F.2 The module delivers the following output:

$Life_{exp}$ = Capital charge for expense risk[63]

$nLife_{exp}$ = Capital charge for expense risk including the risk absorbing effect of future profit sharing

Calculation

TS.XI.F.3 The capital charge for expense risk is determined as follows:

$$Life_{exp} = \Delta NAV \mid expshock$$

where:

[63] Not including the potential risk absorbing effect of future profit sharing

ΔNAV	=	Change in the net value of assets minus liabilities[64]
expshock	=	Increase of 10% in future expenses compared to best estimate anticipations, and increase by 1% per annum of the expense inflation rate compared to anticipations; but for policies with adjustable loadings[65], 75% of these additional expenses can be recovered from year 2 onwards by increasing the charges payable by policyholders.

TS.XI.F.4 The life expense risk scenario should be calculated under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the shock being tested.

An expense payment should not be included in the scenario, if its amount is already fixed at the valuation date (for instance agreed payments of acquisition provisions).

TS.XI.F.5 Additionally, the result of the scenario should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nLife_{exp}$.

TS.XI.F.6 Simplification

Expense risk capital requirement = (Renewal expenses in the 12 months prior to valuation date) * n(exp) *(0.1 + 0.005*n(exp)) Where (n(exp)) = average (in years) period over which risk runs off, weighted by renewal expenses

TS.XI.G. $Life_{rev}$ revision risk

Description

TS.XI.G.1 In the context of the life underwriting risk module, revision risk is intended to capture the risk of adverse variation of an annuity's amount, as a result of an unanticipated revision[66] of the claims process. This risk should be applied only to annuities and to those benefits that can be approximated by a life annuity arising from non-life claims (including accident insurance, but excluding workers compensation) that are allocated to the SCR_{life} module according to the principle set out in paragraph TS.VI.A.3 and following.

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[64] Undertakings should apply the principles in TS.II of the specification regarding assumed policyholder behaviour when assessing the value of the liabilities following the expense shock.

[65] Policies with adjustable loadings are those for which expense loadings or charges may be adjusted within the next 12 months.

[66] This is meant to impact only on annuities that are genuinely reviewable. Annuities whose amount is linked to earnings or another index such as prices or that vary in deterministic value on change of status should not be classified as genuinely reviewable for these attributes.

Output

TS.XI.G.2 The module delivers the following output:

$Life_{rev}$	=	Capital charge for revision risk[67]

Calculation

TS.XI.G.3 The capital charge for revision risk is determined as follows:

$$Life_{\text{rev}} = \Delta NAV \,|\, \text{rev } shock$$

where:

ΔNAV	=	Change in the net value of assets minus liabilities
revshock	=	Increase of 3% in the annual amount payable for annuities exposed to revision risk. The impact should be assessed considering the remaining run-off period.

TS.XI.G.4 On the computation of this risk charge, participants should only consider the impact on those non-life annuities for which there may be a revision process during the next year (e.g. annuities where there are legal or other eligibility restrictions should not be included).

TS.XI.G.5 Simplification

Revision capital requirement = 3% * Total net technical provisions for annuities exposed to revision risk.

TS.XI.H. $Life_{cat}$ catastrophe risk

Description

TS.XI.H.1 Life CAT risks stem from extreme or irregular events (e.g. a pandemic) that are not sufficiently captured by the capital charges of the other life underwriting risk sub-modules.

Output

TS.XI.H.2 The module delivers the following output:

$Life_{CAT}$	=	Capital charge for life catastrophe risk
$nLife_{CAT}$	=	Capital charge for catastrophe risk including the risk absorbing effect of future profit sharing

[67] Not including the potential risk absorbing effect of future profit sharing.

Calculation

TS.XI.H.3 The capital charge for life catastrophe risk component is defined as follows:

$$Life_{CAT} = \Delta NAV \,\big|\, life\ CAT\ shock$$

Where $Life_{CAT}$ shock is combination of the following events all occurring at the same time:

- an absolute 1.5 per mille increase in the rate of policyholders dying over the following year (e.g. from 1.0 per mille to 2.5 per mille)
- an absolute 1.5 per mille increase in the rate of policyholders experiencing morbidity over the following year. Where appropriate, undertakings should assume that one-third of these policyholders experience morbidity for 6 months, one-third for 12 months and one-third for 24 months from the time at which the policyholder first becomes sick.

TS.XI.H.4 Participants are requested to calculate the capital charge for life CAT risk should be calculated under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after a life CAT event.

TS.XI.H.5 Additionally, participants are also requested to determine the result of the scenario under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nLife_{CAT}$.

TS.XI.H.6 Simplification

The following formula may be used as a simplification for the Life catastrophe risk sub-module: the input data is required for each policy where the payment of benefits (either lump sum or multiple payments) is contingent on either mortality or disability:

$$Life_{CAT} = \sum_i 0.0015 \bullet Capital\_at\_Risk_i$$

where the subscript i denotes each policy where the payment of benefits (either lump sum or multiple payments) is contingent on either mortality or disability, and where $Capital\_at\_Risk_i$ is determined as:

$$Capital\_at\_Risk_i = SA_i + AB_i \bullet Annuity\_factor - TP_i$$

and

TP_i	=	Technical provision (net of reinsurance) for each policy i
SA_i	=	For each policy i: where benefits are payable as a single lump sum, the Sum Assured (net of reinsurance) on death or disability. Otherwise, zero.
AB_i	=	For each policy i: where benefits are not payable as a single lump sum, the Annualised amount of Benefit (net of reinsurance) payable on death or disability.

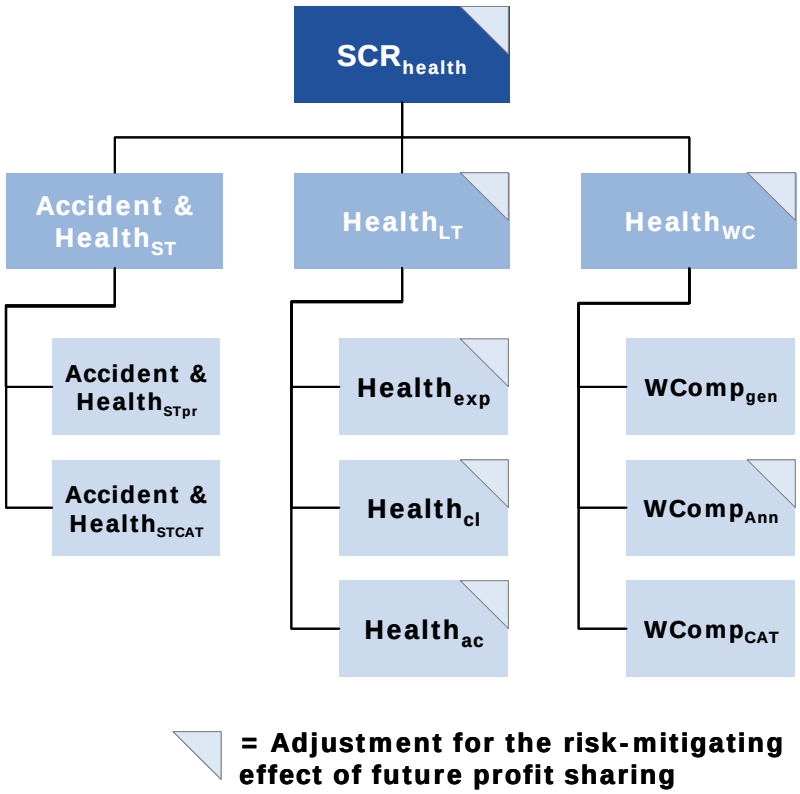
		Otherwise, zero.
Annuity_factor	=	Average annuity factor for the expected duration over which benefits may be payable in the event of a claim

TS.XII. SCR Health underwriting risk module

TS.XII.A. Health underwriting risk Module

TS.XII.A.1 This module is intended to cover underwriting risk for all health and workers' compensation guarantees and is split into three sub-modules: long term health that is practised on a similar technical basis to that of life assurance (which exists only in Germany and Austria), short term health and workers' compensation[68].

TS.XII.A.2 Overall description:



Input

TS.XII.A.3 The following input information is required[69]:

$Health_{LT}$	=	The capital charge for long term health underwriting risk
$Accident\&Health_{ST}$	=	The capital charge for accident & health short term underwriting risk
$Health_{WC}$	=	The capital charge for workers compensation underwriting risk
$nHealth_{LT}$	=	Capital charge for long term health including the risk

[68] Please note that it differs from the health module in QIS3 in that its scope is wider since it includes health lines of business previously included in the non-life underwriting module.

[69] Where each of the capital charges SCR does not include the potential risk absorbing effect of future profit sharing.

absorbing effect of future profit sharing

$nHealth_{WC}$ = Capital charge for workers' compensation underwriting risk including the risk absorbing effect of future profit sharing

Output

TS.XII.A.4 The module delivers the following output:

SCR_{health} = The capital charge for health underwriting risk

$nSCR_{health}$ = Capital charge for health underwriting risk including the risk absorbing effect of future profit sharing

Calculation

TS.XII.A.5 The capital charge for health underwriting risk is derived by combining the capital charges for the health sub-modules using a correlation matrix as follows:

$$SCR_{health} = \sqrt{\sum_{rxc} CorrHealth^{rxc} \bullet Health_r \bullet Health_c}$$

where

$CorrHealth^{rxc}$ = The cells of the correlation matrix *CorrHealth*

$Health_r$, $Health_c$ = Capital charges for individual health underwriting sub-modules according to the rows and columns of correlation matrix *CorrHealth*

and where the correlation matrix CorrHealth is defined as:

CorrHealth	$Health_{LT}$	*Accident &*$Health_{ST}$	$Health_{WC}$
$Health_{LT}$	1		
Accident&$Health_{ST}$	0	1	
$Health_{WC}$	0	0,5	1

TS.XII.A.6 The capital charge for nSCRhealth is determined as follows:

$$nSCR_{health} = \sqrt{\sum_{rxc} CorrHealth_{r,c} \cdot nHealth_r \cdot nHealth_c} \ ,$$

where *nAccident&*$Health_{ST}$ is defined to be *Accident&*$Health_{ST}$ and $nHealth_{WC}$ is defined to be $Health_{WC}$.

TS.XII.B. Health long term underwriting risk module

Description

TS.XII.B.1 This module is concerned with underwriting risk in health insurance that is practised on a similar technical basis to that of life insurance with additional restrictions according to National Law as sold in Germany and Austria[70]. The underwriting risks (including morbidity and disability) within other forms of health insurance practised on a similar technical basis to that of life insurance should be measured using the life underwriting module or the workers compensation.

TS.XII.B.2 Health long-term underwriting risk is split into the three components: expense risk, claim/mortality/cancellation risk and epidemic/accumulation risk.

Input

TS.XII.B.3 The following input information is required:

$Health_{exp}$ = Capital charge for health expense risk

$Health_{cl}$ = Capital charge for health claim / mortality / cancellation risk

$Health_{ac}$ = Capital charge for health epidemic / accumulation risk

$nHealth_{exp}$ = Capital charge for health expense risk including the risk absorbing effect of future profit sharing

$nHealth_{cl}$ = Capital charge for health claim/mortality/cancellation risk including the risk absorbing effect of future profit sharing

$nHealth_{ac}$ = Capital charge for health epidemic/accumulation risk including the risk absorbing effect of future profit sharing

Output

TS.XII.B.4 The module delivers the following output:

$Health_{LT}$ = Capital charge for long-term health underwriting risk (not including the risk absorbing effect of future profit sharing)

$nHealth_{LT}$ = Capital charge for long-term health underwriting risk including the risk absorbing effect of future profit sharing

Calculation

TS.XII.B.5 The capital charge for long term health underwriting risk is derived by combining the capital charges for long term health sub-risks.

$$Health_{LT} = \sqrt{\sum_{rxc} CorrHealthLT_{r,c} \cdot Health_r \cdot Health_c}$$

where

[70] Health insurance within the meaning of Article 16a (4) of the Directive 73/239/EEC (as amended by Directive 2002/13/EC).

$CorrHealthLT^{rxc}$ = the cells of the correlation matrix *CorrHealthLT*

$Health_r$, $Health_c$ = Capital charges for individual health underwriting sub-risks according to the rows and columns of correlation matrix *CorrHealth*

and where the correlation matrix *CorrHealthLT* is defined as:

CorrHealthLT=	$Health_{exp}$	$Health_{cl}$	$Health_{ac}$
$Health_{exp}$	1		
$Health_{cl}$	0.5	1	
$Health_{ac}$	0	0	1

TS.XII.B.6 The capital charge for $nSCR_{HealthLT}$ is determined as follows:

$$nHealth_{LT} = \sqrt{\sum_{rxc} CorrHealthLT_{r,c} \cdot nHealth_r \cdot nHealth_c}$$

$Health_{exp}$ expense risk

Description

TS.XII.B.7 Expense risk arises if the expenses anticipated in the pricing of a product are insufficient to cover the actual costs accruing in the accounting year. There are numerous possible causes of such a shortfall, therefore all cost items of private health insurers have to be taken into account. In order to ensure comparability among the financial years, all annual results will be related to the gross premiums earned in the specific financial year.

Input

TS.XII.B.8 The following input information is required:

$\sigma_{h\,exp}$ = Gross earned premium weighted standard deviation of the expense result in relation to the gross premium over the previous ten-year period

P_{ay} = gross premium earned for the accounting year

Output

TS.XII.B.9 The module delivers the following output:

$Health_{exp}$ = Capital charge for health expense risk

$nHealth_{exp}$ = Capital charge for health expense risk including the risk absorbing effect of future profit sharing

Calculation

TS.XII.B.10 The capital charge for health expense risk is determined as follows:

$$\text{Health}_{\text{exp}} = \lambda_{\text{exp}} \cdot \sigma_{\text{h exp}} \cdot P_{\text{ay}}$$

where

λ_{exp} = expense risk factor which is set to deliver a health expense risk charge consistent with a VaR 99.5% standard

TS.XII.B.11 The factor λ_{exp} is set as:

λ_{exp}
2.58

Special treatment for small and recent health insurance companies

TS.XII.B.12 In some cases, especially for rather recent undertakings, expense results are only available with a short history (i.e. the standard deviation of the expense result cannot be determined directly on the basis of the previous 10 years). Furthermore, expense results relating to the first years after start-up might not be representative of future expense results. In those cases, the gross earned premium weighted standard deviation for the expense result should be estimated as follows:

$$\sigma_{hexp} = \frac{1}{4} \bullet (10 - n') \bullet f_{exp} + \frac{1}{4} \bullet (n' - 6) \bullet \sigma_{hexp}(n)$$

where

$$n' = \min\{\max\{n;6\};10\}$$

and where

n = number of recent accounting years, where the gross premium earned continuously exceeded 3 Mio Euro (at most 10). The number should not allow for the first three years after start up of business

$\sigma_{h\,exp}(n)$ = the gross earned premium weighted standard deviation of the expense result over the previous n-year period

f_{exp} = parameter that will be used to estimate $\sigma_{h\ exp}$ for small companies

TS.XII.B.13 This means that for $n \geq 7$ the company's individual standard deviations $\sigma_{\text{h exp}}(n)$ are taken into account; if $n < 7$, the estimate will be determined solely by the parameter f_{exp} which is independent of the undertaking's individual standard deviations.

TS.XII.B.14 The parameter f_{exp} is determined as follows:

f_{exp}
2%

TS.XII.B.15 The capital charge for health expense risk should be calculated under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the assumed increase in expense costs.

TS.XII.B.16 Additionally, the result of the scenario should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nHealth_{exp.}$

$Health_{cl}$ claim/mortality/cancellation risk

Description

TS.XII.B.17 This risk covers:

- claim risk or per capita loss risk arising in cases where the actual per capita loss is greater than the loss assumed in the pricing of the product;
- mortality risk arising when the actual funds from technical provisions becoming available due to death are lower than those assumed in the pricing of the product; and
- cancellation risk arising when the actual funds from technical provisions becoming available due to cancellations are lower than those assumed in the pricing of the product.

Input

TS.XII.B.18 The following input information is required:

$\sigma_{h\,cl}$ = The gross earned premium weighted standard deviation of the $health_{cl}$ result[71] in relation to the gross premium over the previous ten-year period

P_{ay} = Gross premium earned for the accounting year

[71] The $health_{cl}$ result is the underwriting result with regard to claims, mortality and cancellation risk.

Output

TS.XII.B.19 The module delivers the following output:

$Health_{cl}$ = Capital charge for health claim / mortality / cancellation risk

$nHealth_{cl}$ = Capital charge for health claim/mortality/cancellation risk including the risk absorbing effect of future profit sharing

Calculation

TS.XII.B.20 The capital charge for claim / mortality / cancellation risk is determined as follows:

$$\text{Health}_{\text{cl}} = \lambda_{cl} \cdot \sigma_{\text{h cl}} \cdot \text{P}_{\text{ay}}$$

where

λ_{cl} = $\text{Health}_{\text{cl}}$ risk factor which is set to deliver a health claim / mortality / cancellation risk charge consistent with a VaR 99.5% standard

TS.XII.B.21 The factor λ_{cl} is set as:

λ_{cl}
2.58

Special treatment for small and recent health insurance companies

TS.XII.B.22 In some cases, especially for rather recent undertakings, expense results are only available for a short time period (i.e. the standard deviation of the expense result cannot be determined directly on the basis of the previous 10 years). Furthermore, $\text{health}_{\text{cl}}$ results relating to the first years after start-up might not be representative for future $\text{health}_{\text{cl}}$ results. In those cases, the gross earned premium weighted standard deviation for the $\text{health}_{\text{cl}}$ result should be estimated as follows:

$$\sigma_{hcl} = \frac{1}{4} \bullet (10 - n') \bullet f_{cl} + \frac{1}{4} \bullet (n' - 6) \bullet \sigma_{hcl}(n)$$

where

$$n' = \min\{\max\{n;6\};10\}$$

and where

N = Number of recent accounting years, where the gross premium earned continuously exceeded 3 Mio Euro (at most 10). The number should not allow for the first three years after start up of business

$\sigma_{h\,cl}(n)$ = The gross earned premium weighted standard deviation of the $health_{cl}$ result over the previous n-year period

f_{cl} = Parameter that will be used to estimate $\sigma_{h\,cl}$ for small companies

TS.XII.B.23 This means that for $n \geq 7$ the company's individual standard deviations $\sigma_{h\,cl}(n)$ are taken into account; if $n < 7$, the estimate will be determined solely by the parameter f_{cl} which is independent of the undertaking's individual standard deviations.

TS.XII.B.24 The parameter f_{cl} is determined as follows:

f_{cl}
3%

TS.XII.B.25 The capital charge for health claim / mortality / cancellation risk should be calculated under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the assumed occurrence of a claim / mortality / cancellation event.

TS.XII.B.26 Additionally, the result of the scenario should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nHealth_{cl.}$

***$Health_{ac}$* epidemic / accumulation risk**

Description

TS.XII.B.27 Epidemic / accumulation risk concerns the risks arising from the outbreaks of major epidemics (e.g., a severe outbreak of influenza). Such events typically also lead to accumulation risks, since the usual assumption of independence among persons would be nullified.

Input

TS.XII.B.28 The following input information is required:

$claims_{ay}$ = Claims expenditure for the accounting year in the health insurance market

P_{ay} = Gross premium earned for the accounting year

MP_{ay} = Total gross premium earned for the accounting year in the health insurance market

Output

TS.XII.B.29 The module delivers the following output:

$Health_{ac}$ = The capital charge for health epidemic / accumulation risk

$nHealth_{ac}$ = Capital charge for health epidemic/accumulation risk including the risk absorbing effect of future profit sharing

Calculation

TS.XII.B.30 The capital charge for health epidemic / accumulation risk is determined as follows:

$$Health_{ac} = \lambda_{ac} \bullet claims_{ay} \bullet \frac{P_{ay}}{MP_{ay}}$$

where

λ_{ac} = $health_{ac}$ risk factor

TS.XII.B.31 The factor λ_{ac} is set as:

λ_{ac}
6.5%[72]

TS.XII.B.32 The capital charge for health epidemic risk should be calculated under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the assumed occurrence of an epidemic event.

TS.XII.B.33 Additionally, the result of the scenario should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nHealth_{ac.}$

TS.XII.C. Accident & Health short-term underwriting risk module

Description

TS.XII.C.1 This module covers the premium and reserve risk and catastrophe risk of short term health and accident lines of business

Input

The following input information is required:

$Accident\ \&\ Health_{STpr}$ = Capital charge for premium and reserve risk

$Accident\ \&\ Health_{STCAT}$ = Capital charge for catastrophe risk

Output

TS.XII.C.2 This module delivers the following output information:

$Accident\ \&\ Health_{ST}$ = Capital charge for short term health and accident underwriting risk

Calculation

[72] The specified factor is higher than the factor used under QIS2 (1%) to adequately reflect health epidemic / accumulation risk, as well as the adjusted correlation assumptions for health epidemic / accumulation risk with respect to the other health risk sub-modules.

TS.XII.C.3 The capital charge for short term health and accident underwriting risk is derived by combining the capital charges for the short term health and accident sub-risks using a correlation matrix as follows:

$$Accident\ \&\ Health_{ST} = \sqrt{\sum_{rxc} CorrHealth_{ST}^{rxc} \bullet Accident\ \&\ Health_{ST\,r} \bullet Accident\ \&\ Health_{ST\,c}}$$ where

$CorrHealthST^{rxc}$	=	The cells of the correlation matrix $CorrHealth_{ST}$
$Accident\ \&Health_{STr}, Accident\ \&\ Health_{STc}$	=	Capital charges for individual short term health and accident underwriting sub-risks according to the rows and columns of correlation matrix $CorrHealth_{ST}$

and where the correlation matrix $CorrHealth_{ST}$ is defined as:

$CorrHealth_{ST}$	$Accident\ \&\ Health_{STpr}$	$Accident\ \&\ Health_{STCAT}$
$Accident\ \&\ Health_{STpr}$	1	
$Accident\ \&\ Health_{STCAT}$	0	1

Accident & Health short-term premium and reserve risk

Description

TS.XII.C.4 This module covers the premium and reserve risk of short term health and accident lines of business.

TS.XII.C.5 Premium risk and reserve risk are defined as set in NLpr premium & reserve risk description (TS.XIII.B).

Input

TS.XII.C.6 The input information required is the same as set in NLpr premium and reserve risk input.

Output

TS.XII.C.7 This module delivers the following output information:

$Accident\ \&\ Health_{STpr}$	=	Capital charge capturing the premium risk and the reserve risk

Calculation

TS.XII.C.8 The calculation is computed as set in NLpr premium & reserve risk calculation, using the following parameters.

TS.XII.C.9 Maximum n_{lob}= 5

TS.XII.C.10 In step 1:

The standard deviation for reserve risk in the individual lines of business is determined as follows[73]:

LOB	short term health	accident & others
$\sigma_{res,\ lob}$	7,5%	15%

The market-wide estimate of the standard deviation for premium risk in the individual lines of business is determined as follows:

LOB	short term health	accident & others
$\sigma_{M.prem,\ lob}$	3%	5%

TS.XII.C.11 In step 3:

The correlation matrix $CorrLob_{pr}$ is specified as follows:

$CorrLob_{pr}$	short term health	accident & others
short term health	1	
accident & others	0,5	1

TS.XII.C.12 Undertaking-specific parameters for Accident & Health short-term underwriting risk

In accordance with TS.VI.F and Annex SCR 2 – TS.XVII.D, participants are invited to supply the following additional information to the extent they have been able to calculate it:

- the participant's own estimate of the standard deviation for premium risk; and
- the participant's own estimate of the standard deviation for reserve risk,

for each of the LoBs considered in the formula.

TS.XII.C.13 **Accident & Health short-term catastrophe risk**

TS.XII.C.14 Accident & Health short term catastrophe risk is defined as set in NL_{cat} catastrophe risk description (TS.XIII.C).

[73] For the calculation of the premium and reserve risk in health business subject to the risk mitigating effects of a market-wide and mandatory equalisation system, as exists in the Dutch market, a specific treatment would be justified. For example, the Dutch market proposes to calibrate σ(M, prem,lob) and σ(res,lob) for QIS4 purposes to 1%. Note that the shock is contingent on the status of the equalisation system and may change accordingly in the future. For more information, see Annex SCR5 - TS.XVIIG.

Input

TS.XII.C.15 The input information required is the same as set in NLcat catastrophe risk input.

Output

TS.XII.C.16 This module delivers the following output information:

$Accident \ \& \ Health_{STCAT}$		=	Capital charge capturing the catastrophe risk

Calculation

TS.XII.C.17 The calculation is computed as set in NLcat catastrophe risk calculation, using the following methods:

Method 1:

$$Accident \ \& \ Health_{STCAT} = \sqrt{(C_1 \bullet P_1)^2 + (C_2 \bullet P_2)^2}$$

where P1 and P2 are estimate of the net written premium in the individual LoB "short term health" and accident & others" respectively during the forthcoming year, and C1 = C2 = 0.1

Method 2: scenarios.

TS.XIII.C.18 Some examples of scenarios are outlined below:

TS.XIII.C.19 Health

- Pandemic, e.g. bird flu
- Polio type debilitating disease effects
- Bio-hazard from an insecure laboratory
- Terrorist pathogen released
- Terrorist action with delayed effects (e.g. poisoning a water supply with a difficult to detect and slow working poison)
- Concentrated office block accident (similar to the workers' compensation scenario).

TS.XII.D. Workers compensation underwriting risk module

Description

TS.XII.D.1 This module is concerned with underwriting risk in workers' compensation line of business.

TS.XII.D.2 In general, workers' compensation insurance covers a diversity of liability profiles, related to short-term or long-term sick leave whatever the cause of the sickness should be for instance:

(a) Standard non-life type of liabilities, including medical treatments and lump sum indemnity payments. Due to their characteristics, these claims have commonly a short to medium term perspective[74];

(b) Annuities payable to injured workers' and beneficiaries;

(c) Regular and recurrent benefits on a (generally) long-term basis, specifically aimed to provide life assistance to an injured worker with a significant level of incapacity (e.g. medical treatments on a continuous basis, replacement of artificial limbs, salary to a person providing assistance, etc.)[75]. The main difference with benefits in a) is the expectation that the flow of benefits will continue on a regular basis until the death of the beneficiary.

Input

TS.XII.D.3 The following input information is required[76]:

$WComp_{General}$	=	Capital charge capturing the premium risk and the reserve risk (the latter relating only to the 'standard non-life type of liabilities')
$WComp_{Annuities}$	=	Capital charge capturing the risks stemming from liabilities paid in the form of annuities and 'life assistance' liabilities
$WComp_{CAT}$	=	Capital charge for catastrophe risk
$nWComp_{General}$	=	Capital charge for $WComp_{General}$ including the allowance for the risk absorbing effect of changes in future profit sharing
$nWComp_{Annuities}$	=	Capital charge for $WComp_{Annuities}$ including the allowance for the risk absorbing effect of changes in future profit sharing

[74] In several markets, the scope of workers' compensation insurance is limited to this first type of liabilities.

[75] In the subsequent paragraphs, these liabilities will be referred to as 'life assistance liabilities'.

[76] It is important to note that for some markets, Workers' compensation benefits comprise only the 'standard non-life type of liabilities'. For these cases, participants are only required to calculate the charge $WComp_{General}$, as the charge $WComp_{Annuities}$ will be equal to zero. Thus, for these cases, $WComp=WComp_{General}$.

TS.XII.D.4 The table below identifies the scope of each of the charges in terms of capture of the risks per type of liability and per timing of the event that triggers the benefits.

	Past events (reported and not reported)	***Future events***
Standard non-life type of liabilities	$WComp_{General}$	$WComp_{General}$
Annuities and life assistance	$WComp_{Annuities}$	$WComp_{General}$

Output

TS.XII.D.5 The module delivers the following output:

Health wc = Capital charge for workers' compensation underwriting risk

Calculation

TS.XII.D.6 The capital charges for the workers' compensation underwriting risk is derived by combining the capital charges for the workers' compensation sub-risks using a correlation matrix as follows:

$$WComp = \sqrt{\sum_{r \times c} CorrWComp^{r \times c} \cdot WComp_r \cdot WComp_c}$$

where

$CorrWComp^{rxc}$ = the cells of the correlation matrix *CorrWComp*

$WComp_r$, $WComp_c$ = Capital charges for individual workers' compensation underwriting sub-risks according to the rows and columns of correlation matrix *CorrWComp*

and where the correlation matrix CorrWComp is defined as:

CorrWComp	$WComp_{General}$	$WComp_{Annuities}$	$WComp_{CAT}$
$WComp_{General}$	1		
$WComp_{Annuities}$	0.5	1	
	0	0	1

Similarly, nWComp should be calculated as above but with $nWComp_r$ and $nWComp_c$ replacing $WComp_r$ and $WComp_c$ respectively.

TS.XII.D.7 ***$WComp_{General}$* Premium risk and Reserve risk**[77]

Description

TS.XII.D.8 This sub-module covers premium risk and reserve risk (the latter related only to the 'standard non-life type of liabilities') resulting from the underwriting of workers' compensation insurance contracts. Some forms of workers' compensation insurance covers expose the undertaking to life (mortality/longevity) type catastrophes and the capital associated with this risk, for these covers, needs to be assessed (by inclusion in $Life_{cat}$) as part of SCR_{Life}.

TS.XII.D.9 Premium risk and reserve risk are to be understood as set in NL_{pr} premium & reserve risk description.

TS.XII.D.10 The assessment of the premium risk for Workers' compensation LoB will not differentiate between the type of liabilities (annuities, life assistance and standard non-life type of liabilities) that may stem from future claims.

TS.XII.D.11 In the context of the Workers' compensation LoB, reserve risk is intended to only cover the incurred claims that correspond to the 'standard non-life type of liabilities' classification.

Input

TS.XII.D.12 The input information required is the same as in NLpr premium and reserve risk input (TS.XIII.B.11).

TS.XII.D.13 Please note that

$PCO_{Wcomp,NL}$ = Net provision for claims outstanding in the Workers' compensation LoB, relating to the 'standard non-life type of liabilities'

Premium input however includes the total amount of workers's compensation premiums.

Output

This module delivers the following output information:

$WComp_{General}$ = The capital charge capturing the premium risk and the reserve risk (the latter relating only to the 'standard non-life type of liabilities')

$nWComp_{General}$ = $WComp_{General}$

Calculation

TS.XII.D.14 The calculation is computed as in NLpr premium & reserve risk calculation, using the following parameters.

[77] The latter covering only the "standard non-life type of liabilities".

TS.XII.D.15 Maximum n_{lob} = 5.

However, where the relative weight of longer-term annuity annuities and life assistance is significant (e.g. corresponding best estimate is higher than 50% of the total best estimate of Workers' compensation LoB), participants should use the maximum parameter n_{lob} = 15.

TS.XII.D.16

The standard deviation for reserve risk is $\sigma_{res,NL}$ =10%.

The market-wide estimate of the standard deviation for premium risk is $\sigma_{(M,prem)}$=7%.

TS.XII.D.17

The overall volume measure V is determined as follows:

$$V = V_{prem} + V_{res,NL}$$

where V_{prem} and $V_{res,NL}$ are the volume measures for premium and reserve risk as defined above.

The overall standard deviation σ is determined as follows:

$$\sigma = \sqrt{\frac{1}{V^2} \bullet \left(\sigma_{prem}^2 \cdot V_{prem}^2 + \sigma_{res,NL}^2 \cdot V_{res,NL}^2 + \sigma_{prem} \cdot \sigma_{res,NL} \cdot V_{prem} \cdot V_{res,NL}\right)}$$

TS.XII.D.18 CEIOPS plans to further develop this sub-module after QIS4, addressing the degree to which undertaking-specific information could be built into the formula, and analysing the appropriateness of the calibration

TS.XII.D.19 **Undertaking-specific parameters for Workers' compensation underwriting risk**

In accordance with TS.VI.F and Annex SCR 2 – TS.XVII.D, participants are invited to supply the following additional information to the extent they have been able to calculate it:

- the participant's own estimate of the standard deviation for premium risk; and
- the participant's own estimate of the standard deviation for reserve risk,

for each of the LoBs considered in the formula.

TS.XII.D.20 $WComp_{Annuities}$: Risk stemming from annuities and life assistance liabilities

Description

TS.XII.D.21 This sub-module covers the risks underlying Workers' compensation benefits paid in the form of annuities and life assistance liabilities. It intends to cover liabilities originated from events already incurred at the valuation date[78].

[78] Note that Workers' compensation underwriting risks related to future events are to be fully covered by the $WComp_{General}$ sub-module.

TS.XII.D.22 Regarding life assistance, it is assumed, for the purpose of this module, that the best estimate of these liabilities can be approximated using an annuity factor applied to an 'average' expected annual amount of benefits (note that this annual amount is subject to a certain degree of uncertainty).

TS.XII.D.23 This sub-module is split into longevity risk, revision risk, disability risk and expenses risk.

Input

TS.XII.D.24 The following input information is required:

$Annuities_{long}$	=	Capital charge for longevity risk
$Annuities_{rev}$	=	Capital charge for revision risk
$Annuities_{dis}$	=	Capital charge for disability risk
$Annuities_{exp}$	=	Capital charge for expense risk
$nAnnuities_{long}$	=	Capital charge with longevity risk including the risk mitigating effect of future profit sharing
$nAnnuities_{rev}$	=	Capital charge with revision risk including the risk mitigating effect of future profit sharing
$nAnnuities_{di}$	=	Capital charge with disability risk including the risk mitigating effect of future profit sharing
$nAnnuities_{exp}$	=	Capital charge with expense risk including the risk mitigating effect of future profit sharing

Output

TS.XII.D.25 The sub-module delivers the following output:

$WComp_{Annuities}$	=	Capital charge capturing the risks stemming from liabilities paid in the form of annuities and 'life assistance' liabilities

Calculation

TS.XII.D.26 The capital charge for underwriting risk underlying annuities and life assistance is derived by combining the capital charges for the relevant sub risks using a correlation matrix as follows:

$$WComp_{Annuities} = \sqrt{\sum_{rxc} CorrAnnuities^{rxc} \bullet Annuities_r \bullet Annuities_c}$$

where

$CorrAnnuities^{rxc}$	=	the cells of the correlation matrix *CorrAnnuities*
$Annuities_r$,	=	capital charges for the individual sub-risks according

$Annuities_c$	to the rows and columns of correlation matrix *CorrAnnuities*

and where the correlation matrix CorrAnnuities is defined as:

CorrAnnuities	$Annuities_{long}$	$Annuities_{dis}$	$Annuities_{rev}$	$Annuities_{exp}$
$Annuities_{long}$	1			
$Annuities_{dis}$	0	1		
$Annuities_{rev}$	0	0	1	
$Annuities_{exp}$	0.25	0.5	0.25	1

nWCompAnnuities should be calculated as for WCompAnnuities but with $nAnnuities_r$ and $nAnnuities_c$ replacing $Annuities_r$ and $Annuities_c$ respectively.

TS.XII.D.27 $Annuities_{long}$ longevity risk:

The capital charge for longevity risk shall be calculated along the methodology set in Lifelong longevity risk. The longevity shock to be applied is a (permanent) 25% decrease in mortality rates for each age. $Annuities_{long}$ should be calculated under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the shocks being tested.

$nAnnuities_{long}$ should be calculated under the condition that the assumption that the participant is able to vary its assumptions on future bonus rates in response to the shock being tested. The capital charge for longevity risk shall be calculated along the methodology set in $Life_{long}$ longevity risk, excluding the risk absorbing effect of future profit sharing.

TS.XII.D.28 $Annuities_{dis}$ disability risk:

The capital charge for disability risk shall be calculated along the methodology set in $Life_{dis}$ disability risk, gross of the risk mitigating effect of future profit sharing (no mitigating effect)

The disability shock to be applied is an increase of 35 % in disability rates for the next year, together with a (permanent) 25% increase (over best estimate) in disability rates at each age in following years.

$nAnnuities_{dis}$ should be calculated under the condition that the participant is able to vary its assumptions on future bonus rates in response to the shock being tested. The capital charge for disability risk shall be calculated along the methodology set in $Life_{dis}$ disability risk, excluding the risk absorbing effect of future profit sharing.

TS.XII.D.29 Annuities$_{rev}$ revision risk:

In the context of Workers' compensation LoB, revision risk captures the risk of adverse variation of an annuity's amount, as a result of an unanticipated revision[79] of the claims process and, for those benefits that can be approximated by a life annuity (life assistance), the uncertainty underlying the 'average' annual amount assumed in the computation of the best estimate[80].

On the computation of this risk charge, participants should only consider the impact on those annuities for which a revision process is possible to occur during the next year (e.g. annuities where there are legal or other eligibility restrictions should not be included). Unless the 'average' annual amount is fixed and known with certainty, all those benefits that can be approximated by a life annuity (life assistance) are also subject to revision risk."

TS.XII.D.30 **The capital charge for revision risk shall be calculated along the methodology set in Life$_{rev}$ revision risk**

The revision shock to be applied is:

revshock	=	For annuities: a 2% increase in the annual amount payable For life assistance benefits: a 5% increase in the annual amount payable The impact should be assessed considering the remaining run-off period.

nAnnuities$_{revision}$ should be calculated under the condition that the assumption that the participant that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the shocks being tested.

In addition nAnnuities$_{revision}$ should be calculated under the condition that the assumption that the participant is able to vary its assumptions on future bonus rates in response to the shock being tested.

TS.XII.D.31 Annuities expense risk:

The capital charge for expense risk shall be calculated along the methodology set in Life$_{exp}$ expense risk, excluding the risk absorbing effect of future profit sharing

The expense shock to be applied is:

expshock	=	All future expenses are higher than best estimate anticipations by 10%, and the rate of expense inflation is 1% per annum higher than anticipated

[79] This is meant to impact only on annuities that are genuinely reviewable. Annuities' whose amount is linked to earnings or prices or to some other index or that vary in deterministic value on change of status should not be classified as genuinely reviewable for these attributes.

[80] The eligibility and motivations for such reviews are directly related to the legal or statutory system applicable to the relevant claims. Nevertheless, the most frequent reason seems to be a deterioration of the health condition of the beneficiary.

In addition, $nAnnuities_{exp}$ should be calculated under the condition that the assumption that the participant is able to vary its assumptions on future bonus rates in response to the shock being tested.

TS.XII.D.32 $WComp_{CAT}$: Workers comp catastrophe risk

TS.XII.D.33 Workers comp catastrophe risk is defined as set in NLcat catastrophe risk description.

Input

TS.XII.D.34 The input information required is the same as set in NLcat catastrophe risk input.

Output

TS.XII.D.35 This module delivers the following output information:

$WComp_{CAT}$ = Capital charge capturing the catastrophe risk

Calculation

TS.XII.D.36 The calculation is computed as set in NLcat catastrophe risk calculation, using the following methods:

Method 1:

$Health_{WCCAT} = C \bullet P$

where P is the estimate of the net written premium in the individual LoB "workers comp" during the forthcoming year, and C = 0.07

Method 2: scenarios.

TS.XII.D.37 Some examples of man made scenarios are outlined below:

- An industrial disease could be very costly and affect a large number of people
- A large concentrated accident or terrorist incident involving a large workforce for one firm or in one area

TS.XIII. SCR Non-Life underwriting risk Module

TS.XIII.A SCR_{nl} non-life underwriting risk module

Description

TS.XIII.A.1 Underwriting risk is the specific insurance risk arising from insurance contracts. It relates to the uncertainty about the results of the insurer's underwriting. This includes uncertainty about:

- the amount and timing of the eventual claim settlements in relation to existing liabilities;
- the volume of business to be written and the premium rates at which it will be written; and
- the premium rates which would be necessary to cover the liabilities created by the business written.

Input

TS.XIII.A.2 The following input information is required:

NL_{pr} = Capital charge for premium and reserve risk

NL_{CAT} = Capital charge for catastrophe risk

Output

TS.XIII.A.3 The module delivers the following output:

SCR_{nl} = Capital charge for non-life underwriting risk

Calculation

TS.XIII.A.4 The capital charge for non-life underwriting risk is derived by combining the capital charges for the non-life sub-risks using a correlation matrix as follows:

$$SCR_{nl} = \sqrt{\sum_{rxc} CorrNL^{rxc} \bullet NL_r \bullet NL_c}$$

where

$CorrNL^{rxc}$ = The cells of the correlation matrix *CorrNL*

NL_r, NL_c = Capital charges for individual non-life underwriting sub-risks according to the rows and columns of correlation matrix *CorrNL*

and where the correlation matrix CorrNL is defined as:

CorrNL	NL_{pr}	NL_{CAT}
NL_{pr}	1	
NL_{CAT}	0	1

TS.XIII.B NL_{pr} Non-life premium & reserve risk

Description

TS.XIII.B.1 This module combines a treatment for the two main sources of underwriting risk, premium risk and reserve risk.

TS.XIII.B.2 Premium risk is understood to relate to future claims arising during and after the period until the time horizon for the solvency assessment. The risk is that expenses plus the volume of losses (incurred and to be incurred) for these claims (comprising both amounts paid during the period and provisions made at its end) is higher than the premiums received (or if allowance is made elsewhere for the expected profits or losses on the business, that the profitability will be less than expected).

TS.XIII.B.3 Premium risk is present at the time the policy is issued, before any insured events occur. Premium risk also arises because of uncertainties prior to issue of policies during the time horizon. These uncertainties include the premium rates that will be charged, the precise terms and conditions of the policies and the precise mix and volume of business to be written.

TS.XIII.B.4 Premium risk relates to policies to be written (including renewals) during the period, and to unexpired risks on existing contracts.

TS.XIII.B.5 Reserve risk stems from two sources: on the one hand, the absolute level of the claims provisions may be mis-estimated. On the other hand, because of the stochastic nature of future claims payouts, the actual claims will fluctuate around their statistical mean value.

TS.XIII.B.6 The following numbering of LoBs applies for the calculation[81]:

LoB number	
1	Motor, third-party liability
2	Motor, other classes
3	Marine, aviation, transport (MAT)
4	Fire and other property damage
5	Third-party liability
6	Credit and suretyship

[81] This segmentation is the same as the segmentation applied in the valuation of the technical provisions, excluding the health LoBs which for the purpose of the SCR calculation are treated in a specific module.

7	Legal expenses
8	Assistance
9	Miscellaneous
10	Non-proportional reinsurance – property
11	Non-proportional reinsurance – casualty
12	Non-proportional reinsurance – MAT

TS.XIII.B.7 Both premium and reserve risk include uncertainty in the timing of payments and any cost therein.

TS.XIII.B.8 In order to take into account the geographical diversification, undertakings are requested to calculate a Herfindahl index based on the geographical location of the risks underlying their premiums and reserves.

TS.XIII.B.9 Premiums and provisions have to be allocated between the following geographical areas[82]:

- Each country of the EEA
- Switzerland
- The rest of Europe
- Asia (excluding Japan and China)
- Japan
- China
- Oceania (excluding Australia)
- Australia
- North America (excluding Canada and US)
- Canada
- US
- Each country of South America
- Central America

[82] Please note that the geographical segmentation proposed is purely tentative and has been developed for QIS4 purposes only. It is recognised that further work should be carried out in order to develop a truly risk-sensitive geographical segmentation

- Africa

TS.XIII.B.10 If an undertaking has more than 95% of its non-life activities (premium and reserves) in the same geographical area, it will not benefit from geographical diversification. An aggregate materiality threshold of 5% should apply to allow any geographical diversification.

Input

TS.XIII.B.11 The following input information is required:

$PCO_{j,lob}$	=	best estimate for claims outstanding in geographical area j in each of the LoBs
$P_{j,lob}^{t,written}$	=	estimate of net written premium in geographical area j in the individual LoB during the forthcoming year
$P_{j,lob}^{t,earned}$	=	estimate of net earned premium in geographical area j in the individual LoB during the forthcoming year
$P_{j,lob}^{t-1,written}$	=	net written premium in geographical area j in the individual LoB during the previous year
n_{lob}	=	number of historic years (at most 5, 10 or 15 years according to the LoB) The number should not allow for the first three years after start up of the line of business
LR_{lob}^{y}	=	net loss ratios[83] in each of the LoBs and for historic years *y=t-1, t-2,..., t-n*
$Pj_{,lob}^{y,earned}$	=	earned net premiums in geographical area j in each of the LoBs and for historic years *y=t-1, t-2,..., t-n*

TS.XIII.B.12 The loss ratio LR_{lob}^{y} is defined as the ratio for year y of incurred claims in a given LoB over earned premiums, determined at the end of year y. The earned premiums should exclude prior year adjustments, and incurred claims should exclude the run-off result, that is they should be the total for losses occurring in year y of the claims paid (including claims expenses) during the year and the provisions established at the end of the year.

Undertakings that account on an underwriting year basis are invited to comment on any difficulties they have with this specification.

TS.XIII.B.13 The loss ratios should not be adjusted in order to exclude one-time effects which are deemed not to be representative for the current premium risk (e.g. catastrophic claims). If the participant is able to derive a more suitable time series of loss ratios, it may be used to derive undertaking-specific parameters as defined in TS.VI.F.

TS.XIII.B.14 The estimates $P_{lob}^{t,written}$ and $P_{lob}^{t,earned}$ are provided by the participant.

[83] Loss ratios (rather than combined ratios, as in QIS2) are used since these provide a more objective basis for the measurement of volatility, and since this lessens the burden on undertakings with respect to data collection.

TS.XIII.B.15 The maximum value of n_{lob} is fixed according to the line of business in the following table:

LoB	***Maximum n_{lob}***
2, 4, 7, 8, 10	5
3, 9, 12	10
1, 5, 6, 11	15

Output

TS.XIII.B.16 This module delivers the following output information:

NL_{pr} = Capital charge for premium and reserve risk

Calculation

TS.XIII.B.17 The capital charge for the combined premium risk and reserve risk is determined as follows:

$$NL_{pr} = \rho(\sigma) \bullet V$$

where

V = Volume measure

σ = standard deviation for the combined ratio of the overall portfolio [84]

$\rho(\sigma)$ = A function of the standard deviation

TS.XIII.B.18 The function $\rho(\sigma)$ is specified as follows:

$$\rho(\sigma) = \frac{\exp(N_{0.995} \bullet \sqrt{\log(\sigma^2 + 1)})}{\sqrt{\sigma^2 + 1}} - 1$$

where

$N_{0.995}$ = 99.5% quantile of the standard normal distribution

[84] i.e. the combined ratio calculated using the Solvency II discounted technical provisions, as opposed to the "classical" combined ratio calculated using Solvency I technical provisions.

TS.XIII.B.19 The function $\rho(\sigma)$ is set such that, assuming a lognormal distribution of the underlying risk, a risk capital charge consistent with the VaR 99.5% standard is produced. Roughly, $\rho(\sigma) \approx 3 \bullet \sigma$.

TS.XIII.B.20 The volume measure V and the standard deviation σ of the combined ratio for the overall non-life insurance portfolio are determined in three steps as follows:

- in a first step, for each individual line of business (LOB)[85] standard deviations and volume measures for both premium risk and reserve risk are determined;
- in a second step, for each individual line of business (LOB), geographical diversification is determined
- in a third step, the standard deviations and volume measures for the premium risk and the reserve risk in the individual LOBs are aggregated to derive an overall volume measure V and an overall standard deviation σ.

The calculations needed to perform these three steps are set out below.

Step 1: Volume measures and standard deviations per LOB

TS.XIII.B.21 In an individual line of business LOB, the volume measures and standard deviations for premium and reserve risk are denoted as follows:

$V_{(prem,j,lob)}$	=	The volume measure in geographical area j for premium risk
$V_{(res,j,lob)}$	=	The volume measure in geographical area j for reserve risk
$\sigma_{(prem,lob)}$	=	standard deviation for premium risk
$\sigma_{(res,lob)}$	=	standard deviation for reserve risk

TS.XIII.B.22 The volume measure for reserve risk in geographical area j in the individual LOB is determined as follows:

$$V_{(res,j,lob)} = PCO_{j,lob}$$

TS.XIII.B.23 The volume measure for premium risk in the individual LOB is determined as follows:

$$V_{(Prem,j,lob)} = \max\left(P^{t,written}_{j,,lob} ; P^{t,earned}_{j,,lob} ; 1.05 \bullet P^{t-1,written}_{j,,lob} \right)$$

TS.XIII.B.24 If the insurer has committed to its regulator that it will restrict premiums written over the period so that the actual premiums written (or earned) over the period will not exceed its estimated volumes, the volume measure is determined only with respect to estimated premium volumes, so that in this case:

[85] With regards to the definition of the segmentation of the non-life insurance portfolio into segments, we refer to paragraph TS.VI.B.1.

$$V_{(prem,J,lob)} = \max(P_{j,lob}^{t,written}; P_{j,lob}^{t,earned})$$

TS.XIII.B.25 The standard deviation for reserve risk in the individual LOB is determined as follows[86]:

LOB =	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
$\sigma_{(res,lob)}$	12%	7%	10%	10%	15%	15%	10%	10%	10%	15%	15%	15%

TS.XIII.B.26 The standard deviation for premium risk in the individual LOB is derived as a credibility mix of an undertaking-specific estimate and a market-wide estimate as follows:

$$\sigma_{(prem,lob)} = \sqrt{c_{lob} \bullet \sigma_{(U,prem,lob)}^2 + (1 - c_{lob}) \bullet \sigma_{(M,prem,lob)}^2}$$

where

c_{lob} = Credibility factor for LOB

$\sigma_{(U,prem,lob)}$ = Undertaking-specific estimate of the standard deviation for premium risk

$\sigma_{(M,prem,lob)}$ = Market-wide estimate of the standard deviation for premium risk

TS.XIII.B.27 The market-wide estimate of the standard deviation for premium risk in the individual LOB is determined as follows:

LOB =	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
$\sigma_{(M,prem,lob)}$	9%	9%	12.5 %	10%	12.5 %	15%	5%	7.5 %	11%	15%	15%	15%

[86] Please note that the proposed calibration for the "reserve risk" standard deviations is tentative and has been developed for QIS4 purposes only. It is recognised that further work should be carried out in order to refine this calibration by dedicating a specific workstream to this issue. In any case, QIS4 participants quantitative feed-back on the proposed standard calibration for "reserve risk" is most welcome.

TS.XIII.B.28 The credibility factor c_{lob} is defined in the following table:

c_{lob}		***Number of historical years of data available (excluding the first 3 years after the line of business was first written)***														
Maximum value of n_{lob}		*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
	15	*0*	*0*	*0*	*0*	*0*	*0*	*0,64*	*0,67*	*0,69*	*0,71*	*0,73*	*0,75*	*0,76*	*0,78*	*0,79*
	10	*0*	*0*	*0*	*0*	*0,64*	*0,69*	*0,72*	*0,74*	*0,76*	*0,79*	-	-	-	-	-
	5	*0*	*0*	*0,64*	*0,72*	*0,79*	-	-	-	-	-	-	-	-	-	-

TS.XIII.B.29 Similar to the premium risk a credibility approach will be investigated by CEIOPS in the future for reserving risk. The results of QIS4 will be used to test this.

TS.XIII.B.30 The undertaking-specific estimate $\sigma_{(U,prem,lob)}$ of the standard deviation for premium risk is determined on the basis of the volatility of historic loss ratios as follows:

$$\sigma_{(U,prem,lob)} = \sqrt{\frac{1}{(n_{lob}-1)\bullet V_{(prem,lob)}} \bullet \sum_{y} P_{lob}^{y,e} \bullet \left(LR_{lob}^{y} - \mu_{lob}\right)^2}$$

where

μ_{lob} = company-specific estimate of the expected value of the loss ratio in the individual LOBs

$P^{y,e}{}_{lob}$ = $P^{y,earned}{}_{lob} = \sum_{j} P_{j,lob}^{y,earned}$

and μ_{lob} is defined as the premium-weighted average of historic loss ratios:

$$\mu_{lob} = \frac{\sum_y P_{lob}^{y,e} \bullet LR_{lob}^{y}}{\sum_y P_{lob}^{y,e}}$$

It is calculated by geographically consolidated line of business (without consideration to geographical differentiation).

The standard deviation for premium and reserve risk in the individual LoB is defined by aggregating the standard deviations for both subrisks under the assumption of a correlation coefficient of $\alpha = 0.5$:

$$\sigma_{(lob)} = \frac{\sqrt{\left(\sigma_{(prem,\,lob)} V_{(prem,\,lob)}\right)^2 + 2\alpha\sigma_{(prem,\,lob)}\sigma_{(res.lob)} V_{(prem,\,lob)} V_{(res.lob)} + \left(\sigma_{(res,\,lob)} V_{(res,\,lob)}\right)^2}}{V_{(prem,\,lob)} + V_{(res,\,lob)}}$$

Step 2: Geographical diversification

TS.XIII.B.31 Diversification is not allowed for the following LoBs: miscellaneous and credit and suretyship insurance.

TS.XIII.B.32 The Herfindahl index for premiums and reserves for each line of business (LoB) is calculated as follows:

$$DIV_{pr,lob} = \frac{\sum_j (V_{(prem,j,lob)} + V_{(res,j,lob}))^2}{\left(\sum_j (V_{(prem,j,lob)} + V_{(res,j,lob)})\right)^2},$$

where the sum of premiums and reserves is taken over the non life business of the considered entity and j is the index for the geographical areas.

TS.XIII.B.33 The overall volume measure V is determined as follows:

$$V = \sum_{Lob} V_{lob}$$

where, for each individual line of business LoB, V_{lob} is the geographically diversified volume measure for premium and reserve risk as defined hereunder:

$V_{lob} = (V_{(prem, lob)} + V_{(res, lob)}) * (0.75+0.25*DIV_{pr,lob})$

where, for each individual line of business LoB, $V_{(prem,lob)}$ and $V_{(res,lob)}$ are the volume measures for premium and reserve risk as defined hereunder.

$$V_{(prem,lob)} = \sum_j V_{(prem,j,lob)} \text{ and } V_{(res,lob)} = \sum_j V_{(res,j,lob)}$$

TS.XIII.B.34 Besides the calculations included from TS.XIII.B.31 to TS.XIII.B.33, participants are asked to offer alternatives approaches to measuring geographical diversification in the non-life premium and reserve risk.

Step 3: Overall volume measures and standard deviations

TS.XIII.B.35 The overall standard deviation σ is determined as follows:

$$\sigma = \sqrt{\frac{1}{V^2} \cdot \sum_{rxc} CorrLob_{r,c} \cdot \sigma_r \cdot \sigma_c \cdot V_r \cdot V_c}$$

where

r,c	=	All indices of the form (lob)
$CorrLob^{rxc}$	=	the cells of the correlation matrix *CorrLob*
V_r, V_c	=	Volume measures for the individual lines of business, as defined in step 2

TS.XIII.B.36 The correlation matrix CorrLob is specified as follows:

CorrLob	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1: M (3rd party)	1											
2: M (other)	0,5	1										
3: MAT	0,5	0,25	1									
4: Fire	0,25	0,25	0,25	1								
5: 3rd party liab	0,5	0,25	0,25	0,25	1							
6: credit	0,25	0,25	0,25	0,25	0,5	1						
7: legal exp.	0,5	0,5	0,25	0,25	0,5	0,5	1					
8: assistance	0,25	0,5	0,5	0,5	0,25	0,25	0,25	1				
9: misc.	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	1			
10: reins. (prop)	0,25	0,25	0,25	0,5	0,25	0,25	0,25	0,5	0,25	1		
11: reins. (cas)	0,25	0,25	0,25	0,25	0,5	0,5	0,5	0,25	0,25	0,25	1	
12: reins. (MAT)	0,25	0,25	0,5	0,5	0,25	0,25	0,25	0,25	0,5	0,25	0,25	1

TS.XIII.B.37 The non-life underwriting risk module will be further developed after QIS4, addressing the degree to which undertaking-specific information could be built into the formula, and analysing the appropriateness of the calibration.

TS.XIII.B.38 Undertaking-specific parameters for non-life underwriting risk

In accordance with TS.VI.F and Annex SCR 2 – TS.XVII.D, participants are invited to supply the following additional information, to the extent this is available:

- the participant's own estimate of the standard deviation for premium risk; and

- the participant's own estimate of the standard deviation for reserve risk,

for each of the LoBs considered in the formula.

TS.XIII.B.39 Simplification

Insurance and reinsurance captives defined as an (re)insurance undertaking owned either by a financial undertaking other than an insurance or a reinsurance undertaking or a group of insurance or reinsurance undertakings to which Directive 98/78/EC applies, or by a non-financial undertaking, the purpose of which is to provide (re)insurance cover exclusively for the risks of the undertaking or undertakings to which it belongs or of an undertaking or undertakings of the group of which the captive (re)insurance undertaking is a member, are allowed to apply a simplification, provided that they satisfy the general criteria for simplifications (see para TS.VI.G.6).

If a captive does not meet the threshold indicated, but nevertheless thinks it should be allowed to apply a simplified approach, it can do so provided that it justifies the reason for this and stating the criteria it considers relevant in its situation. The participant is also expected to do the full calculation to allow CEIOPS to benchmark the simplified calculation. All participants are invited to comment on the level of threshold.

Under these circumstances, the following simplification can be applied to the NL_{pr}:

$NL_{pr} = 0.45 * (Rt - Pt, earned)$

where

- Pt, earned = estimate of net earned premium during the forthcoming year
- Rt = contractually agreed maximum annual claims net of reinsurance.

TS.XIII.C NL_{cat} CAT risk

Description

TS.XIII.C.1 CAT risks stem from extreme or irregular events that are not sufficiently captured by the charges for premium and reserve risk. In order to avoid double counting, the calibration of the scenarios and market losses should allow for the parts of catastrophe risks which are already covered by premium and reserve risk.

TS.XIII.C.2 The CAT risk sub-module can be calculated following two alternative methods:

Method 1: standard approach

If no regional scenarios are provided, a standard formula is applied.

Method 2: scenarios

If regional scenarios are available, provided by the local supervisor (the supervisor of the relevant territory, not necessarily the insurer's own supervisor), they replace the standard formula of method 1. Regional scenarios include natural catastrophes and man-made catastrophes.

Optional: personalised scenarios

In addition, undertakings may, on an optional basis, use personalised catastrophe scenarios according to the classes of business written and geographic concentration, and explaining the appropriate definition for calculation purposes (Method 3).

TS.XIII.C.3 **Method 1:** standard approach

Input

TS.XIII.C.4 The following input information is required:

$P_{lob}^{t,written}$ = estimate of the net written premium in the individual LoB during the forthcoming year

TS.XIII.C.5 Output

NL_{CAT} = Capital charge for the non-life catastrophe risk

Formula

TS.XIII.C.6 The capital charge for the non-life CAT risk is determined as follows:

$$NL_{CAT} = \sqrt{\left(\sum_{t \neq 3,4,10,12} \left(c_t \times P_t\right)^2 + \left(c_3 \times P_3 + c_{12} \times P_{12}\right)^2 + \left(c_4 \times P_4 + c_{10} \times P_{10}\right)^2 \right)}$$

LoB t	***Factor c_t***
1. Motor, 3rd-party	*0.15*
2. Motor, other	*0.075*
3. MAT	*0.50*
4. Fire	*0.75*
5. 3rd-party liab	*0.15*
6. Credit	*0.60*
7. Legal exp.	*0.02*
8. Assistance	*0.02*
9. Misc.	*0.25*
10. Reins (prop)	*1.50*
11. Reins (cas)	*0.50*
12. Reins (MAT)	*1.50*

TS.XIII.C.7 **Method 2:** scenarios

Input

TS.XIII.C.8 The input requirements for the regional scenarios are specified by the local supervisor – the supervisor of the relevant territory, not necessarily the insurer's own supervisor. Where participants have material exposure in more than one region, they are requested to consider the scenarios for each such region (i.e. they are requested to run more independent regional scenarios). For QIS4, no trans-regional scenario has been developed (a trans-regional scenario being a scenario where a single catastrophic event simultaneously impacts more than one region). However, where participants have their business located in more than one region, they may apply a personalised trans-regional scenario, as specified in Method 3.

Choice of scenarios

TS.XIII.C.9 The regional scenarios are described in Annex SCR 3 (TS.XVII.E).

Output

TS.XIII.C.10 This module delivers the following output information:

NL_{CAT} = The capital charge for non-life catastrophe risk

Calculation

TS.XIII.C.11 The capital charge for non-life CAT risk is determined as follows:

$$NL_{CAT} = \sqrt{\sum_i CAT_i^2}$$

where the summation is over those specified catastrophes that exceed the materiality threshold, and

CAT_i = the cost of specified catastrophe i

TS.XIII.C.12 The materiality threshold is set as 25% of the cost of the most severe scenario. Therefore participants will take into account a) the most severe scenario and b) additionally, any other scenario whose cost exceeds 25% of the cost of the most severe scenario.

TS.XIII.C.13 For each of the scenarios specified, participants have to estimate the cost CAT_i of the scenario (i.e. the effect on the net value of assets and liabilities) if the cost exceeds the materiality threshold.

TS.XIII.C.14 For regional scenarios, the calculation of CAT_i should follow the specifications set out by the local regulator. This could either be based on a scenario-based approach, or a market loss approach.

TS.XIII.C.15 Where more than one regional scenario (in the same national market) is relevant for a participant, the aggregation of the results of the calculation for each of the regional scenarios

should follow the specifications determined by the local supervisor. The aggregated result is then combined further with the other scenarios as set out above.

TS.XIII.C.16 Non-proportional non-life reinsurance business and non-life insurance and reinsurance business that is located in areas outside of the European Economic Area – for which areas no regional scenarios are provided - shall not be allowed for in the approach described above. Instead, to the extent to which the business may give rise to catastrophe risk, participants shall quantify the risk by means of a partial internal model. The capital charge for this risk shall be added to the capital charge derived under the approach described above.

TS.XIII.C.17 **Method 3 – optional:** personalised scenarios

TS.XIII.C.18 This method may be chosen by the firm when the calibration obtained under method 1 or method 2 is considered by the firm to be unrepresentative of their cat exposure. Method 3 enables a firm to propose a personalised cat calibration, based on their own business.

TS.XIII.C.19 In method 3, firms should calculate their personalised catastrophe scenarios according to the classes of business written and geographic concentration, and explaining the appropriate definition for calculation purposes. The "catastrophe personalisation" can include partial or full internal model output (including where available commercial catastrophe model output), but is equally applicable where modelling is not carried out

TS.XIII.C.20 Firms should explain how they selected their scenarios.

TS.XIII.C.21 Firms may use commercial cat models for relevant classes, and where they are available. However, if none are available, this should not stop the participant from using the approach based on its own deterministic estimates, derived from experience and judgment.

Options for CAT calibration in Method 3: occurrence basis vs annual basis

TS.XIII.C.22 Occurrence basis

Cat scenarios are defined on the basis of the occurrence of a single event, e.g. single windstorm, flood, earthquake, fire, explosion.

CAT_i = Cost for scenario i, net of reinsurance, allowing for the cost of reinstatement premiums and / or loss or profit commission and any exceptional costs incurred by the firm in post event management

The scenarios to be selected are those that the firm considers will exceed the materiality threshold, which is 25% of the most severe scenario.

$$CAT_{NL} = \sqrt{\sum_i CAT_i^2}$$

TS.XIII.C.23 Annual basis

Annual basis is to be used when assessing the effect reinsurance treaties on the non-life CAT risk exposure

For most firms, the SCR calibration in line with a 99.5% confidence level over a one-year time horizon is likely to involve the occurrence of not one catastrophic event, but a series of catastrophic events over the forthcoming 12 months. In most reinsurance treaties, distinct catastrophic events are subject to separate retentions, as well as different reinstatements and associated costs. Therefore when participants have to simulate a series of events to derive CAT_{NL}, they should take into account the impact of those separate retentions, reinstatements and associated costs on their non-life CAT risk exposure.

Personalised CAT scenarios should always reflect the full 12-month exposure. For example, for flood risk, a single scenario might include the financial impact of multiple events during a single 12-month period.

CAT_{NL} = The firm's estimate of the aggregate cost, net of reinsurance, allowing for the cost of reinstatement premiums and / or loss or profit commission and any exceptional costs incurred by the firm in post event management, calibrated to the SCR requirement of Solvency II.

TS.XIII.C.24 Some examples of man made scenarios are outlined below:

TS.XIII.C.25 Motor 3rd party

- Car falls onto railway line, causing a train to derail – multiple deaths and injuries;
- Mont Blanc type event e.g. in Mont Blanc or Channel Tunnel;
- Level crossing accident including a train (possibly including a suicide, even though it would be an intentional act;
- Petrol tanker crash or collision, causing noxious fumes and poisoning;
- Lorry accident involving another form of public transport with long-term injuries, not death;
- An accident involving nuclear material on a train.

TS.XIII.C.26 Motor (Other):

- Driver's own debilitating injuries following an accident;
- Epidemic of cars being taken without owner's consent and damaged.

TS.XIII.C.27 MAT:

- Oil rig event like Piper Alpha;
- A number of high worth vehicles in transit or on another transport are destroyed;

- Aviation collision (see QIS3);
- Aviation crash or collision during take-off or landing, including collision with airport buildings;
- Piracy – damage to property, theft, injury and death;
- LPG ship collision with a cruise ship carrying high net worth individuals.

TS.XIII.C.28 Fire:

- Terrorism event (from QIS3);
- Total loss to the largest single property risk (QIS3);
- Buncefield type event (http://www.buncefieldinvestigation.gov.uk/index.htm);
- Flixborough (http://www.hse.gov.uk/comah/sragtech/caseflixboroug74.htm);
- Oil wells exploding;
- National Galleries, historic sites destroyed;
- Conflagration across a city centre (covering property (some historic), petrol stations etc).

TS.XIII.C.29 3rd Party Liability:

- New latent claims;
- New individual diseases – from chemicals etc.
- Enron, Parmalat type events leading to D&O, E&O claims;
- Construction: ship building (e.g. insolvency half way through building), builders, architects;
- Pharmaceuticals: e.g. Thalidomide http://news.bbc.co.uk/1/hi/uk/2031459.stm);
- Large medical claim e.g. baby born with brain damage through medical malpractice and, in particular, a series of such claims arising from consistent errors;
- Pollution.

TS.XIII.C.30 Credit:

- Total impact of single policy, e.g. credit or bond guarantees of single largest policy holder.
- Wider recession, effect of interest rates, e.g. 1930 global recession.

TS.XIII.C.31 Assistance

- Terrorism at Olympic Games (QIS3).

TS.XIII.C.32 Miscellaneous

- Very successful product sold with extended waivers that are all claimed upon because of a latent defect in the product.

TS.XIV. Internal Models

TS.XIV.A. Introduction and background

TS.XIV.A.1 To progress further the impact of the Framework Directive Proposal in relation to the use of internal models for calculating the solvency capital requirement SCR participants are strongly encouraged to answer the questions 1 to 51 listed in this section. The answers to these questions are important as they will be used by CEIOPS when developing implementation measures and the guidance on internal models for calculating the SCR.

TS.XIV.A.2 The goals of the fourth Quantitative Impact Study (QIS4) for internal models are:

(a) To collect reliable and comparable quantitative data from partial and full internal models that are currently used by firms for assessing their capital needs. This data will assist CEIOPS in conducting a range of statistical analyses and then providing advice to the EC and other stakeholders when discussing the calibration of the standard model and its likely impacts on the Solvency II regime (TS.XIV.C and D);

(b) To collect high level qualitative information from insurance undertakings that use internal models for assessing their capital needs to influence the qualitative aspects of the implementation measures (included in TS.XIV.C); and

(c) to collect general information from all insurance undertakings to assess the current and potential future status of internal modelling in Europe (TS.XIV.B).

TS.XIV.A.3 To achieve the first goal, firms will have to assess the quality and comparability of the data against high level principles. Therefore firms should concentrate on comparing the results and the modelling aspects of the standard formula with those derived from their internal models. Key areas to address in this context are the modelling requirements of the Framework Directive Proposal and the data that has been used when firms calibrate their models. It is important also to understand the differences in assumptions and definitions between those underlying existing models in firms and those anticipated under Solvency 2[87].

TS.XIV.A.4 To this end, and to the extent that this is practicable, the estimates derived from internal models should be compatible with the overall calibration objectives for the standard formula (i.e. a VaR 99.5% confidence level over a one year time horizon should be used).

TS.XIV.A.5 The importance of qualitative issues is highlighted by the second goal. We are not seeking detailed qualitative information at this stage, but it is likely that further analysis will be undertaken at a later stage.

TS.XIV.A.6 Finally, the QIS4 exercise should also serve as a tentative mapping exercise of the current development stage of internal models used by market participants, and to indicate to what extent insurance undertakings plan to use an internal model for calculating their solvency capital requirement or use partial models to calculate modules of the SCR or in respect of some or all modules for some but not all of their business units. To gain an accurate picture of

[87] For instance the valuation of assets and liabilities under Solvency 2 differs from that currently used by undertakings.

current developments, internal models referred to in this section should be understood as comprising those that include any risk management system analysis to quantify risks and to help to assess the economic capital needed to meet those risks.

TS.XIV.B. Questions for all insurance undertakings (both solo entities and groups)

TS.XIV.B.1 In this part, information is gathered on some general internal modelling issues from all insurance undertakings.

1. Are you,

   (a) already using internal models for some aspects of your business (yes / no)?

   (b) actively developing and managing internal models for use in your business? (yes / no)?

2. Do you have plans to use an internal model in the future for calculating the SCR at least partially (yes / no/not decided yet)?

   (a) If no, why is that the case (too expensive, too demanding, too large administrative burden, standard SCR works well, other reasons – please specify)?

   (b) If yes,

      i. Do you have plans to seek full internal model or partial internal model approval (full / partial)?

      ii. What are your main reasons for planning to seek full or partial internal model (better risk management / better capital management / lower regulatory capital / more transparent decision-making / other – please specify)?

      iii. If you plan to seek partial internal model, for which risk modules, sub-modules or business lines (see Articles 105 and 106 of the Framework Directive Proposal and the graph in para TS.VI.A.1) in the SCR do you plan to substitute internal models for the standard model?

      iv. Given the current state of development of your model, how long do you expect it will take to have the envisaged model at the point where Solvency 2 approval standards might be met (less than one year / 1-2 years / 3-4 years / more than 4 years)?

      v. We recognise that detailed requirements for model approval are dependent upon implementing measures, which are themselves currently "work in progress". Nonetheless, from your understanding of requirements per the Framework Directive Proposal and your anticipation of the implementing measures, could you please provide an indication of potential costs as follows:

         - On the understanding that your internal modelling work, even in the absence of Solvency 2, would enable you to develop a reliable assessment of your undertaking's capital needs, including the embedding of your capital model within the business and the maintenance of auditable documentation (yes / no / don't know yet),

- Do you believe that you will incur costs in respect of Solvency 2 model approval requirements in addition to costs that would otherwise be incurred? (yes / no / don't know yet).

vi. If yes, please indicate if possible

- the total cost that is expected to relate purely to solvency 2 approvals activity of the internal model in a) absolute amounts (euro) and b) relative to annually incurred expenses in the income statement,

- the total upfront cost that is expected to relate purely to solvency 2 activity of the internal model in a) absolute amounts (euro) and b) relative to annually incurred expenses in the income statement, and

- the annual cost on a going concern basis of the internal model that is expected to relate purely to Solvency 2 activity in a) absolute amounts (euro) and b) relative the annually incurred expenses in the income statement.

(c) Do you think that it would be inappropriate to apply the standard formula for calculating your SCR (yes, because your risk profile deviates from the assumptions underlying the standard formula / yes, for other reasons – please specify / no)?

(d) If yes because your risk profile deviates from the assumptions underlying the standard formula, please provide the possible reasons for this (deviations in terms of risk exposure / deviations in terms of volatility / non-linear dependency of risks / presence of cycles / incompatibilities of your risks with the SCR modular approach / other - please specify).

(e) Please give a tentative view of the potential increase/decrease in SCR caused by the application of an internal model (an increase of more than 20 % / an increase of 10-20% / an increase of 0-10 % / no significant change / a decrease of 0-10 % / a decrease of 10-20 % / a decrease of more than 20 % / can not say).

3. If yes to either 1a or 1b:

(a) Briefly describe your progress in internal model development during past few years and where are you at this stage compared to your longer term goals?

(b) In which areas are internal models already used (risk limit setting / risk strategy / capital allocation / strategic business decisions / budgeting / product development / pricing / performance analysis / ALM / reinsurance / bonus setting / investment policy / dividend payments / market consistent technical provision / CoC risk margin / assessment of uncertainty in technical provisions / asset allocation / management compensation / other areas – please specify)?

(c) In which areas do you intend to develop internal models (for guidance, see some of the possible applications set out in question 3b)?

(d) If you have plans to use a full or partial internal model in the future for calculating the SCR what additional steps do you foresee to make your current internal models suitable for Solvency 2 purposes?

TS.XIV.C. Questions for insurance undertakings using an internal model for assessing capital needs (both solo entities and groups)

TS.XIV.C.1 In this part the information requests are based on the articles of the Framework Directive Proposal and concern only those insurance undertakings (both solo entities and groups) that are currently using either for regulatory or internal reasons an internal model for assessing capital needs.

TS.XIV.C.2 Full and partial internal models (art. 110)

4. Which risks or activities are included in your partial internal model? (See para TS.VI.A.1, art. 105-106, 111 and where possible use the terminology of the Framework Directive Proposal).

5. Please compare the structure of your partial internal model with that of the standard model. For instance, which risk modules of the standard formula are a) combined, b) divided in your partial internal model?

6. Which risks are included in your internal model, but not covered by the standard formula?

7. Which relevant risks are not included in your internal model, but covered by the standard formula?

8. Has the internal model been created in-house or licensed from an external software supplier (in-house / in-house but using a purchased modelling platform / partly in-house and partly purchased / purchased)[88]?

9. If purchased please explain the function/use of the main models and the providers?

Following questions 10-20 apply only to groups:

10. Does the internal model cover all the entities within the scope of the group?

11. Does it take into account all re-insurance undertakings?

12. What kind of entities are not covered and why?

13. How do you then consider the impact of these entities on the group as a whole?

14. Does the model take into account activities in other financial sectors?

15. How do you then consider the impact of these entities in other financial sectors on the group as a whole?

16. Are similar risk types aggregated across financial sector borders?

17. To what extent does the model take account of the existence of non-regulated entities in the scope of the group (in particular holding companies and special purpose vehicles)?

18. If the model does not take into account all of the entities of the group, please indicate which part of the business the internal model covers (as a proportion of premiums of the group and the technical provisions and the proportion in terms of solvency capital requirements as determined by the solo SCRs calculated with the standard formula)?

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[88] More than one may apply.

19. In your opinion, does your current model cover all the material risks that are borne by a group? What kind of group specific risks do you consider and in what practical way do you take them into account?

20. If you identify and assess these risks (like group risks, reputational risks, and strategic risks etc.) only in a qualitative way, in which way do these risks fit in your risk profile?

TS.XIV.C.3 Use test (art. 118)

21. An internal model used for assessing capital needs may inform decision making in other areas or processes either directly or because it is constructed from models used in those areas or processes. Which different areas or processes can be identified that make use of the internal model (for guidance, see some of the possible applications listed in question 3b)?

22. To what extent does your risk management strategy consider the results produced by your internal model (to a small degree / to a medium degree / to a large degree)?

23. Are the outputs of the internal model included in regular reporting for the

    (a) board of directors (yes / no), and

    (b) other senior management (yes / no)?

24. Is your internal model approved by the

    (a) board of directors (yes / no), and

    (b) other senior management (yes / no)?

TS.XIV.C.4 Statistical quality (art. 119)

25. Does your internal model produce by way of output a probability distribution forecast (art. 119, points 1 and 2) (yes / no)?

26. If yes, does the probability distribution forecast indicate the variation of own funds with respect of a 12 months horizon (yes / no)?

27. Are the methods used to calculate the probability distribution forecast consistent with the methods used to calculate solvency 2 technical provisions (yes / no)?

28. Do you consider that your internal model has the ability to rank risk sufficiently for risk management purposes (art. 119, point 4, and also CEIOPS DOC-08-07, points 6.33-6.39) (yes / mostly / not yet)?

29. If yes, briefly describe the criteria you have applied to risk ranking.

30. Do you consider that the data used by your internal model is sufficiently accurate, complete and appropriate (art. 118, point 3) (totally agree / partially agree / partially disagree / disagree)? Please specify this to the extent possible by risk or activity (see para TS.VI.A.1 and where possible use the terminology of the Framework Directive Proposal).

31. What are your main sources (name or description of time series) of input data for key risk modules/drivers? For each source:

(a) What are the sampling periods for each main input data (beginning year - ending year)?

(b) What are the sampling frequencies for each main input data (daily / weekly / monthly / quarterly / half-yearly / annually)?

(c) Specify for each main input data if it is publicly available (yes / no), entity-specific (yes / no) or external but not publicly available (yes / no)?

32. In your internal model, are dependencies taken into account (art. 119, point 5)

(a) within risk categories (yes / no) and

(b) across risk categories (yes / no)?

33. If yes, what is generally the basis of your correlation measure or other dependency measure (expert opinion / data (e.g. historic time series) / by simulation / other – please specify)?

34. Do you take into account risk mitigation techniques in your internal model (art. 119, point 6) (yes / partly / no)?

35. If yes, in which risk categories see para TS.VI.A.1 and where possible use the terminology of the Framework Directive Proposal) and for each such category what kinds of techniques are taken into account (traditional reinsurance / ART / securitisation / loss absorbing technical provisions / loss absorbing other liabilities / tax issues / asset and liability hedging strategies / other ones – please specify)?

36. Are future management actions taken into account (art. 119, point 8) (yes / partly / no)?

37. If yes or partly, what kinds of future management actions are taken into account (changes in future bonus rates / reductions in surrender values / changes in asset dispositions / changes in expense charges / changes in risk premium charges / changes in or use of dynamic option and guarantee charge mechanisms / restrictions in the ability to surrender / other ones – please specify)?

TS.XIV.C.5 Calibration (art. 120)

38. Is the risk measure of your internal model

(a) VaR only / TailVaR only/ Both / Neither– please specify?

(b) What is the level of confidence used in your internal model (in percentages, rating or other measure)?

(c) What is the time horizon (in years, e.g. 1)?

(d) Can a recalibration be done in line with the SCR standards to a calibration of 99.5% VaR over a 1 year horizon (art. 120, point 1) (yes / no) (if already calibrated to this standard please answer yes)?

(e) If yes, how would you perform the recalibration (directly from the probability distribution forecast / scaling using normal distribution assumption / scaling using some other distribution assumption / other parametric transformation function / in other ways - please specify)?

39. Do you use different risk measures, confidence levels or time horizons for different modules or risk drivers (yes / no)?

40. If yes, briefly describe how results coming from different calibrations are aggregated.

TS.XIV.C.6 Profit and loss attribution (art. 121)

41. Do you have a process in place that demonstrate how the categorisation of risk chosen in the internal model explains the causes and sources of profits and losses (yes / partly / no)?

TS.XIV.C.7 Validation (art. 122)

42. Do you have a validation process in place for your internal model (yes / partly / no)?

43. If yes or partly,

(a) Is the unit that is responsible for the validation task also responsible for a) design (yes / partly / no), b) implementation (yes / partly / no), c) documentation (yes / partly / no) and d) the use (yes / partly / no) of the internal model (art 43 point 5)?

(b) Are the people responsible for the validation task a) independent from the persons who take operational decisions (yes / partly / no) and b) independent from the area/departments where risk activities are exercised? (yes / partly / no)

(c) Is the validation task done independently from the a) design (yes / partly / no), b) implementation (yes / partly / no), c) testing (yes / partly / no), d) documentation (yes / partly / no) and e) use (yes / partly / no) of the internal model?

(d) Do you have a process in place to monitor the appropriateness of the calibration of your internal model (yes / partly / no)?

(e) Concerning the appropriateness of the probability distribution forecasts and their underlying assumptions:

i. to what extent do you compare probability distribution forecasts and their underlying assumptions with actually observed and available statistical data (art. 122 subsection 3 and see also CEIOPS DOC-08-07 point 6.22) (forecasts and all underlying assumptions to the extent possible / forecasts and most underlying assumptions / forecasts and only key underlying assumptions / forecasts only / only some key assumptions / not at all)?

ii. do you use additional stability analysis regarding changes in key underlying assumptions and/or the impact on the shape of the probability distribution tails – including sensitivity of the results (art. 122 subsection 4 and see also CEIOPS DOC-08-07 point 6.23) (yes / no)?

(f) Do you have a process in place to monitor the rank-ordering ability of your internal model (yes / partly / no)?

(g) Are you validating how accurate, complete and appropriate the data used by your internal model is (yes / partly / no)?

(h) Do you have a process in place to review what the outputs of your internal model would be under circumstances that are different (e.g. stressed) from those prevailing on the valuation date (yes / partly / no)?

(i) Do you have a process in place to review how volatile the outputs of your internal model are across economic cycles (yes / partly / no)?

TS.XIV.C.8 Documentation (art. 123)

44. To what extent does your documentation give a detailed outline of the theory, assumptions, and the mathematical and empirical basis underlying the internal model (0 % / 0-20 % / 20-40 % / 40-60 % / 60-80 % / 80-100 % / 100 % of a complete documentation of the theory, assumptions, and mathematical and empirical basis underlying the model)?

45. To what extent is the internal model documented considering the design and the operational details of the model (0 % / 0-20 % / 20-40 % / 40-60 % / 60-80 % / 80-100 % / 100 % of a complete documentation of the design and operational details)?

46. To what extent does your documentation demonstrate the compliance of the internal model with the Articles 118 to 122 that is the use test, statistical quality standards, calibration standards, profit and loss attribution and validation standards (0 % / 0-20 % / 20-40 % / 40-60 % / 60-80 % / 80-100 % / 100 % of a complete documentation of Articles 118 and 122)?

47. Does the documentation indicate circumstances under which the internal model does not work effectively (yes all / partly / no)?

48. If yes, briefly describe those circumstances.

49. Are subsequent changes of the model documented (yes / partly / no)?

50. Are responsibilities and accountabilities documented for each position related to the internal modelling system in place (yes / partly / no)?

51. Briefly describe to what extent you are currently disclosing information publicly about the input, modelling and output issues of your internal model?

TS.XIV.D. Quantitative data requests for insurance undertakings using an internal model for assessing capital needs (both solo entities and groups)

TS.XIV.D.1 To the extent possible, estimates of required capital produced by full or partial internal models (for solo and group participation) should be supported and compared with the results calculated according to the risk classes/modules, sub-classes, lines of business and formulas of the standard SCR, which also includes estimates for the absorbing effects of future discretionary profit sharing in life insurance. Groups are required to provide the results obtained by their internal model implemented for the whole group, including non-EEA activities. Participants should also provide the amounts of diversification effects obtained for each level of aggregation of risks. Groups are also requested to describe how diversification is treated in their Internal Model with particular reference to EEA/non-EEA and worldwide segmentation and to state how lines of business with emphasis especially but not exclusively on how with-profits are dealt with.

TS.XIV.D.2 Participants should explain the reasons for differences between their internal model estimates and the results of the standard formula modelling treatments.

TS.XIV.D.3 It should be noted that a disaggregation of the output from internal models to the level of granularity of the standard formula may not be feasible for all internal models and internal lines of business may not be fully compatible with those used in the QIS. However, internal estimates for capital corresponding to main risk classes (see para TS.VI.A.1) and the overall SCR is especially welcomed (both solo-entity and group results). Similarly, more granular results (risk sub-classes) and capital requirements for lines of business or modules of the internal model that are different from the standard formula modules are also welcomed.

TS.XIV.D.4 The estimates derived from full or partial internal models should be compatible with the calibration objectives for the standard formula, i.e. a VaR 99.5 % standard over a one year time horizon (art. 120). This means that for comparability reasons and, for QIS4 purposes only, a recalibration should be performed if other objectives are used.

TS.XIV.D.5 Some specific data requests on internal models will be also included in the spreadsheet (e.g. correlations and diversification effects at different levels, risk mitigation effects, scenario parameters, volatility parameters). Moreover, description of the original calibration (i.e. before any recalibration) for the main risk categories should be disclosed (e.g. risk measure, confidence level, time horizon).

TS.XV. Minimum Capital Requirement

TS.XV.A. Introduction

TS.XV.A.1 This section provides instructions for testing a combined approach for the calculation of the MCR. This combined approach is given by CEIOPS' linear MCR approach combined with a cap of 50% and a floor of 20% of the SCR (whether calculated using the standard formula or an internal model). .

TS.XV.A.2 The linear approach simplifies the modular approach tested in QIS3. It builds up on the margin over liabilities (percentage of technical provisions) approach, but makes it more risk-sensitive by adding other volume measures. However, asset-side volume measures are excluded from the variant of the linear approach specified below.

TS.XV.A.3 A calibration paper has been published on 31 January 2008, testing the calibration of the QIS4 MCR on several countries' QIS3 data.

TS.XV.B. Overall MCR calculation

Input

TS.XV.B.1 The following input information is required:

MCR_{NL}	=	the linear MCR for non-life business (before applying any cap or floor)
MCR_{Life}	=	the linear MCR for life business (before applying any cap or floor)
MCR^*_{NL}	=	the linear MCR for non-life business similar to life business (before applying any cap or floor)
MCR^*_{Life}	=	the linear MCR for supplementary non-life business underwritten in addition to life insurance (before applying any cap or floor)
SCR	=	the SCR of the participant[89]

Output

TS.XV.B.2 The calculation provides the following outputs:

MCR_{linear}	=	the linear MCR, i.e. the sum of the linear MCRs for each type of business undertaken by the participant, before applying any cap or floor

[89] Where participants have provided information both on their SCR calculated using the standard formula and their SCR calculated using a full or partial internal model, the MCR should be calculated twice, first using the standard formula SCR and second using the internal model SCR.

$MCR_{combined}$	=	the combined MCR of the participant, as calculated by the combined approach, after applying the cap and the floor (50% and 20% of the SCR respectively) to the linear MCR
MCR	=	the final MCR of the participant, as calculated by applying the absolute minimum floor to the combined approach

Calculation

TS.XV.B.3 Participants should first calculate the components of their linear MCR, depending on the type of business they write, namely: MCR_{NL}, MCR_{NL}*, MCR_{Life}, and MCR_{Life}*. The instructions for the calculation of those components are further specified below.

Then in a second step the overall linear MCR of the participant is set equal to the sum of the components of the linear MCR:

(a) for non-life participants:

$$MCR_{linear} = MCR_{NL} + MCR*_{NL}$$

(b) for life participants:

$$MCR_{linear} = MCR_{Life} + MCR*_{Life}$$

(c) for composite participants, which conduct both life and non-life business:

$$MCR_{linear} = MCR_{NL} + MCR*_{NL} + MCR_{Life} + MCR*_{Life}$$

Then in a third step, the combined Minimum Capital Requirement is calculated, by applying the cap and the floor (50% and 20% of the SCR respectively) to the linear MCR.

$$\text{MCRcombined} = \{\min[\max(MCR_{linear}; 0.2 \cdot SCR); 0.5 \cdot SCR]\}$$

TS.XV.B.4 In the last step, the absolute floor referred to in Article 127(1)d is applied to the combined MCR: $MCR = \max\{MCRcombined; AMCR\}$

where AMCR is the absolute floor of the MCR:

$AMCR$	=	1 million EUR for non-life insurance undertakings and for reinsurance undertakings
	=	2 million EUR for life insurance undertakings
	=	1 million EUR + 2 million EUR = 3 million EUR for composite undertakings

Notional non-life and life linear MCR (for composite undertakings) [90]

TS.XV.B.5 Composite participants are also requested to report the following outputs:

[90] Please see Annex TS.XVII.L Composites for further details on the treatment of composites.

$NMCR_{NL}$ = the notional non-life linear MCR of the participant

$NMCR_{Life}$ = the notional life linear MCR of the participant

TS.XV.B.6 The notional non-life and life linear MCR are calculated as follows:

$$NMCR_{NL} = MCR_{NL} + MCR*_{NL}$$

$$NMCR_{Life} = MCR_{Life} + MCR*_{Life}$$

TS.XV.C. Linear MCR for non-life business

Input

TS.XV.C.1 The following input information is required:

TP_{lob} = technical provisions (not including the risk margin) for each line of business, net of reinsurance, subject to a minimum of zero

P_{lob} = written premiums in each line of business at the reporting date, net of reinsurance, subject to a minimum of zero

The technical provision volume measures defined above should not include those liabilities that are disclosed separately as non-life liabilities valued according to life insurance principles (e.g. technical provisions for non-life annuities).

Output

TS.XV.C.2 The module delivers the following outputs:

MCR_{NL} = the MCR for non-life business (before applying any cap or floor)

Calculation

TS.XV.C.3 The MCR for non-life business is calculated by the following function:

$$MCR_{NL} = \sum_{lob} \max\left(\alpha_{lob} \cdot TP_{lob}; \beta_{lob} \cdot P_{lob}\right) .$$

TS.XV.C.4 The factors α_{lob} and β_{lob} are determined as follows:

LoB	*name of LoB*	α_{lob}	β_{lob}
1	A&H – workers' compensation	0.13	0.09
2	A&H – health insurance	0.10	0.04
3	A&H – others/default	0.20	0.06
4	Motor, third-party liability	0.16	0.12
5	Motor, other classes	0.09	0.12

6	Marine, aviation, transport	0.13	0.16
7	Fire and other property damage	0.13	0.13
8	Third-party liability	0.20	0.16
9	Credit and suretyship	0.20	0.20
10	Legal expenses	0.13	0.06
11	Assistance	0.13	0.10
12	Miscellaneous	0.13	0.14
13	NP reinsurance – property	0.20	0.20
14	NP reinsurance – casualty	0.20	0.20
15	NP reinsurance – MAT	0.20	0.20

TS.XV.D. MCR for non-life business – activities similar to life insurance

TS.XV.D.1 Certain non-life lines of business may include claims that are similar in nature to life insurance business. Health insurance practised on a similar technical basis to that of life insurance and non-life annuities have been identified as such activities, whose MCR is specified in this subsection.

Input

TS.XV.D.2 The following input information is required:

TP_h = technical provisions (not including the risk margin), net of reinsurance, subject to a minimum of zero for health insurance that is practised on a similar technical basis to that of life insurance

TP_a = technical provisions (not including the risk margin) other than TP_h that are disclosed separately as non-life liabilities valued according to life insurance principles according to TS.II.E.4 to TS.II.E.6 (e.g. technical provisions for non-life annuities), net of reinsurance, subject to a minimum of zero

Output

TS.XV.D.3 The module delivers the following outputs:

MCR^*_{NL} = the MCR for non-life business similar to life business (before applying any cap or floor)

Calculation

TS.XV.D.4 The MCR for non-life business similar to life is calculated by the following function:

$$MCR^*_{NL} = \alpha_h \cdot TP_h + \alpha_a \cdot TP_a$$

TS.XV.D.5 The factors α_h and α_a are determined as follows:

$\alpha_h = 0.013$,

$\alpha_a = 0.025$.

TS.XV.E. MCR for life business

Input

TS.XV.E.1 The following input information is required:

$TP_{WP\_guaranteed}$	=	technical provisions (net best estimate) for guaranteed benefits relating to with-profits contracts
TP_{WP_bonus}	=	technical provisions (net best estimate) for discretionary bonuses relating to with-profits contracts
TP_i	=	technical provisions (not including the risk margin), net of reinsurance, subject to a minimum of zero for each segment *i* other than with-profits business according to the granularity defined below
CAR_j	=	capital at risk (i.e. the sum of the amounts currently payable on death or disability and the present value of annuities payable on death or disability less the technical provision held for each policy that gives rise to a financial strain on immediate death or disability of the insured) calculated net of reinsurance for each segment *j* according to the granularity defined below
Exp^*_{ul}	=	only with respect to non-retail unit-linked business and management of group pension funds where the policyholder takes the investment risk: the amount of last year's net administrative expenses

Output

TS.XV.E.2 The module delivers the following outputs:

MCR_{Life}	=	the MCR for life business (before applying any cap or floor)

Calculation

TS.XV.E.3 The MCR for life business is calculated by the following function:

$$MCR_{Life} = \max\left\{\alpha_{WP\_guaranteed} \cdot TP_{WP\_guaranteed} + \alpha_{WP\_bonus} \cdot TP_{WP\_bonus};\ \gamma \cdot TP_{WP\_guaranteed}\right\} + \\ + \sum_{i\{non-WP\}} \alpha_i \cdot TP_i + 0.25 \cdot Exp*_{ul} + \sum_j \beta_j \cdot CAR_j \ .$$

TS.XV.E.4 The factors relating to technical provisions for with-profits business, are determined as follows[91]:

$\alpha_{WP\_guaranteed} = 0.035$,

$\alpha_{WP\_bonus} = -0.09$,

$\gamma = 0.015$;

TS.XV.E.5 The factors α_i applied to technical provisions other than with-profits business, following the segmentation of life technical provisions, are the following:

1st level segment	***Risk driver***	
	Death or Savings	Survivorship or Morbidity
Unit-linked	0.005	0.0175
Non-profit	0.01	0.035
Reinsurance accepted	see below	see below

TS.XV.E.6 Reinsurance accepted should be apportioned according to the segmentation of direct classes, using the same factors as for direct business.

TS.XV.E.7 Unit-linked products with a guarantee on survival should use a 0.0175 factor.

TS.XV.E.8 The factors β_j are determined as follows:

J	*Outstanding term of contract*	β_j
1	5 years or more	0.00125
2	3 to 5 years	0.0009
3	3 years or less	0.0005

[91] For background information, please refer to CEIOPS-DOC-02/2008 – QIS4 background document: Calibration of SCR and MCR (31 January 2008).

TS.XV.F. MCR for life business – supplementary non-life insurance

TS.XV.F.1 This subsection provides specification for the calculation of the MCR of supplementary non-life insurance underwritten in addition to life insurance. The MCR of such classes is calculated in a manner technically similar to the non-life MCR.

Input

TS.XV.F.2 The following input information is required:

TP_{lob} = technical provisions (not including the risk margin) for each line of business, net of reinsurance, subject to a minimum of zero

P_{lob} = written premiums in each line of business at the reporting date, net of reinsurance, subject to a minimum of zero

Output

TS.XV.F.3 The module delivers the following outputs:

MCR^*_{Life} = the MCR for supplementary non-life business underwritten in addition to life insurance (before applying any cap or floor)

Calculation

TS.XV.F.4 The MCR for supplementary non-life business is calculated by the following function:

$$MCR_{NL} = \sum_{lob} \max\left(\alpha_{lob} \cdot TP_{lob}; \beta_{lob} \cdot P_{lob}\right) .$$

The factors α_{lob} and β_{lob} are identical to the non-life MCR factors defined above.

TS.XVI. QIS 4 Technical Specifications for Groups

TS.XVI.A. Introduction

TS.XVI.A.1 This section provides specifications for calculating and reporting group capital requirements and group own funds. Groups were specifically addressed for the first time in QIS3. QIS4 develops those initial specifications in order to test the methods set out in the Directive; it is essential that as many groups as possible participate in QIS4.

TS.XVI.A.2 The competent authority responsible for group supervision (the current Lead Supervisor appointed by each Coordination Committee) will manage the QIS4 process for each of their groups as in QIS3.

TS.XVI.A.3 The specifications in QIS4 are designed for the purposes of QIS4 only and do not necessarily reflect final solutions for Solvency II.

TS.XVI.A.4 Data should be valued in accordance with the QIS4 valuation specifications (TS.I). 2007 annual accounts may be taken as a starting point which should be adjusted for material differences with QIS4 valuation standards. Where this is not possible material differences should be noted.

TS.XVI.A.5 When completing the Group specifications set out in this section participants are requested to consider the qualitative questions highlighted in grey:

- Questions marked with a dark coloured bar on the side should be answered by all participants.

- In the case of dashed bars, only those participants should answer for whom this question is relevant.

1. Which were the major practical difficulties encountered in producing group data for QIS4? Do you have any suggestions about how to solve these problems?

2.

(a) Can you provide an estimate of the additional resources (in fte months) that are likely to be required:

i. to develop appropriate group systems and controls, and

ii. to carry out a valuation each year of the group SCR in accordance with the methodology proposed here?

(b) What level of resource (in fte months) was required to complete the group aspects of QIS4?

3. Please provide some assessment of the reliability and accuracy of the data you have input for the group SCR.

4. Please set out any views you may have about the suitability and appropriateness of the methodology set out in this specification, about the comprehensibility of definitions, about incentives

for effective risk management, and about any simplifications that might sensibly be introduced to increase the practicability of the calculations, for the calculation of:

(a) the group SCR, and

(b) group own funds.

Objectives

TS.XVI.A.6 QIS4 has four main objectives in respect of groups:

- to establish a functional standard SCR formula and own funds calculation for groups,
- to establish an appropriate recognition of group level diversification effects in the standard SCR formula for groups,
- to collect information on the use of internal group models, and
- to collect information on the group support regime.

Data requirements

TS.XVI.A.7 Groups participating in QIS4 are requested to calculate the following:

- the group capital requirement and the group own funds according to the following two methods:
  - the standard SCR formula & own funds calculation applied to the consolidated group position (i.e. the default accounting consolidation method set out in Article 228 of the Framework Directive Proposal), see sub-section B;
    - in addition, groups which have non-EEA entities and /or with-profits life business are also invited to show the results of 2 variations on this method to assess the extent of the diversification benefits arising from non-EEA entities (Variation 1, see sub-section C) and from with-profit businesses (Variation 2, see sub-section D) .
  - the sum of the solo SCRs & own funds of each group entity (i.e. the Alternative Method, the deduction and aggregation method set out in Article 231), see sub-section E;
    - in order to produce an accurate group position in the Solvency II context, this method needs to be adjusted to eliminate market and counterparty risk charges on intra-group transactions
    - the unadjusted sum of solo SCRs of each group entity will also be calculated from the output of the solo spreadsheets in order to distinguish intra-group effects from diversification effects when comparing this method with the accounting consolidation method

- the group capital requirements and capital resources under the regime currently in force for (re)insurance entities, as calculated under the Insurance Groups Directive or Financial Conglomerates Directive, as appropriate, see sub-section F;

TS.XVI.A.8 For the purposes of the calculation of equity risk in the group specifications only the default approach should be applied (See TS.IX.C.9-19). For non-insurance and non-financial participations the reduced charges set out in Option 1 of Annex SCR1 (See TS.XVII.C.3-7) should be applied. Insurance and other financial participations and subsidiaries should be treated as set out in paragraphs TS.XVI.B.5-9.

TS.XVI.A.9 Groups are also invited to provide the results of any internal models which they may use to calculate group capital requirements. For the Qualitative Questionnaire and data requests for internal models please refer to TS.XIV.

TS.XVI.A.10 It is recognised that performing multiple calculations as set out above can lead to extra resource commitment and cost, but this information is essential in assessing the impact of diversification effects in those areas and participants are encouraged to perform as many calculations as possible.

TS.XVI.A.11 The proportionality rules which apply to the solo specifications also apply to the groups specifications.

TS.XVI.A.12 The following table summarises which calculations should be performed for each type of insurance groups.

		All the groups	Groups with with profits business	Groups with non EEA activities	Groups with non EEA activities and with profits business
Worldwide consolidated	Section B	×[92]	×	×	×
Non EEA consolidated variation	Section C			×[93]	×
With profit business consolidated variation	Section D		×[94]		×
Sum of solo SCRs	Section E	×[95]	×	×	×
Deduction aggregation	Section E	×[96]	×	×	×
Solvency 1	Section F	×[97]	×	×	×
Group SCR floor	Section G	×[98]	×	×	×
Internal model	Section H	×[99]	×	×	×
Group support	Section I	×	×	×	×

92 Default method of the directive proposal.
93 Variation of the default method of the directive proposal
94 Variation of the default method of the directive proposal
95 Already calculated with the solo exercise
96 Alternative method of the directive proposal
97 Available independently of QIS 4 exercise
98 Already calculated with the solo exercise
99 The amount of work is proportional to the existence or the stage of development of the internal model

Scope of Consolidation

TS.XVI.A.13 Calculations shall be carried out at the level of the ultimate EEA participating (re)insurance[100] undertaking or insurance holding company (i.e. the EEA entity which normally issues consolidated accounts) and its group as defined in Article 211 of the Framework Directive Proposal. In addition, groups may provide calculations carried out at the level of the ultimate worldwide participating undertaking. If under Solvency 1 a group calculates its solvency position with combined accounts it may continue to do so for QIS4 purposes.

Diversification Benefits & Capital Transferability issues

TS.XVI.A.14 The group SCR and own funds as calculated under the default method will be compared with the results of the other approaches set out in TS.XVI.A.7 as indicators of diversification benefits and restrictions on capital transferability recognised in the default method. It is important therefore that the same group entities are included in all calculations.

5. Participants are invited to describe any difficulties they experience in following any of the following technical specifications. Where an alternative approach is used this should be noted and an explanation should be given.

TS.XVI.B. Default method: Accounting consolidation

Required Group Capital

TS.XVI.B.1 The method for calculating the standard formula group SCR set out in this sub-section applies the default method set out in Articles 228 of the Framework Directive Proposal (accounting consolidation method). This applies the solo standard SCR formula to the group as if it were a single entity.

TS.XVI.B.2 This method recognises diversification benefits between different group entities, including between EEA and non-EEA (re)insurance entities and with-profit businesses[101]. The calculation also takes into account any participations in (re)insurance entities according to paragraph TS.XVI.B.6. No diversification benefits are recognised for non-insurance participations (see TS.XVI.B.5 below) or participations with no control relationship (see TS.XVI.B.7). All worldwide (re)insurance undertakings of the group (including any non-EEA (re)insurance undertakings) should be taken into account in the calculations. Groups may take into account geographical diversification benefits where these are permitted in the Standard Formula for the solo entity.

TS.XVI.B.3 The component of Group SCR in respect of the (re)insurance entities in the group, as set out in TS.XVI.B.2 above, is termed $SCR_{wwconso}$. This component is calculated by applying the Standard Formula approach to the SCR to the group (re)insurance business as if it were a single entity. The balance sheet for the group (re)insurance business, including both EEA and non-EEA entities, should therefore be calculated based on QIS4 specifications.

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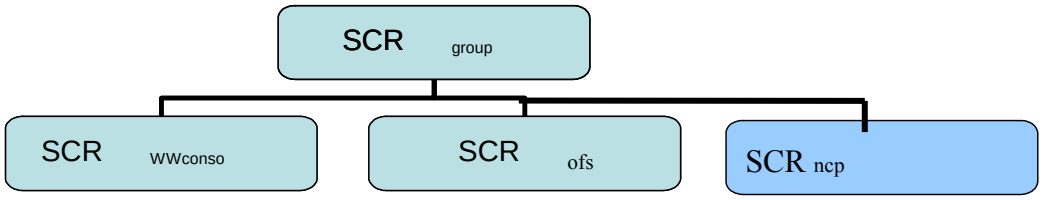
[100] In these specifications any reference to insurance undertaking can also be taken to include reinsurance undertakings.

[101] The Commission has indicated that the draft directive recognises diversification benefits across the whole of a group, not just within the EEA, when calculating the group SCR. The prudential impact of this is unclear. QIS4 aims to identify and analyse these effects. This method provides a benchmark for analysis by comparison with the variations to the method set out in sections C & D.

Total Group SCR

TS.XVI.B.4 The total capital requirement for the group is then calculated as the sum of the consolidated SCR ($SCR_{wwconso}$) and of the SCR for other financial sectors (SCR_{ofs}) and the SCR for non-controlled participations (SCR_{ncp}). This can then be shown as a bottom-up aggregation of the SCR components as in the diagram below:



Further detail on specific elements of $SCR_{wwconso}$, SCR_{ofs} and SCR_{ncp} are set out in sections TS.XVI.B.5 to TS.XVI.B.19 below.

Participations in other financial sector entities

TS.XVI.B.5 The contribution of participations held in other financial sectors to the capital requirement of the group should be the other financial sector's requirements. When participations in another financial sector form a group for which a specific capital requirement exists, the latter, (instead of the sum of the requirements of each solo entity) should be used. This will form SCR_{ofs} which is added to $SCR_{wwconso}$ without recognition of any diversification effects.

Participations in (re)insurance entities[102]

TS.XVI.B.6 When the group's participation in an EEA (re)insurer is regarded as a relationship of control according to the definition of the proposal directive, the contribution to the group SCR for this participation would follow a "look-through approach"[103]. This is consistent with the full consolidation of the participation in the accounts or the proportional consolidation (if there is jointly shared control of the participation). In case of a full consolidated participation, minority interests would in turn contribute to cover part of the group SCR, with some limitations (see TS.XVI.B.23 and TS.XVI.B.24).

TS.XVI.B.7 When the group's participation in an EEA (re)insurer is greater or equal than 20% but without a relationship of control the contribution to the group SCR in respect of the participation should be calculated as the group's share in the participation multiplied by the solo SCR of this participation. This would be consistent with the equity method consolidation where such participation would be accounted for at equity value in the group's consolidated accounts. The contribution of these participations to the group SCR would be the sum of the above-mentioned calculations. If the solo SCR of the current year is not available, then the previous SCR should be used, adjusted for the annual movement in premiums.

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[102] See CEIOPS website for further guidance: http://www.ceiops.eu/content/view/118/124/

[103] TS.XVI.B.6 &TS.XVI.B.7 describes the consolidation treatment for the purpose of calculating the group SCR. This is distinct from the solo treatment of participations for the purpose of calculating the solo SCR set out in TS.VI.E.

TS.XVI.B.8 When the group's interest in an EEA (re)insurer is lower than 20% the contribution to the group SCR in respect of the participation should be calculated by applying the equity risk charge to the value of the participation.

TS.XVI.B.9 The contribution of the EEA (re)insurance undertakings in which the group has no relationship of control will form SCR_{ncp} ("SCR of non controlled participations").

Non life underwriting risk

NL_{pr}

TS.XVI.B.10 In order to take into account geographical diversification, groups are asked to calculate a Herfindahl index based on the geographical location of the risks underlying their premiums and reserves. The calculation at group level should be performed in accordance with the QIS4 specifications for solo undertakings.

6. In addition, groups are invited to recommend any alternative approaches to geographical diversification and also provide the results of those approaches. In particular groups which use a group internal model are invited to describe how geographical diversification is treated in their model.

7. Please explain if there are any additional adjustments to the standard model correlations which should be made in your opinion due to country specific risks, size of entities, etc.?

Counterparty default risk

TS.XVI.B.11 The group's Loss Given Default (LGD) should be calculated by summing up all of the solo LGDs for a particular counterparty. LGDs for intra-group transactions have to be eliminated and are therefore equal to zero in the group calculation. These combined LGD amounts and the methodology described in TS.X.A should be used to determine the group counterparty default risk capital requirement. The LGDs from each specific entity are summed because risk mitigants are generally relevant only for each entity and are therefore not effective more widely.

Life underwriting risk

TS.XVI.B.12 The method is the same as at solo level.

Market risk

TS.XVI.B.13 The method is the same as at solo level except for the following adjustments.

Mkt_{int}

TS.XVI.B.14 The effect of interest rate shocks can be calculated on the consolidated approach by working with the components of the $SCR(Mkt_{int})$ calculated for each solo entity or with-profit fund. The calculation needs to take into account that upward and downward shocks on interest rate cannot happen at the same time. The $SCR(Mkt_{int})$ for the Group can then be expressed as follows:

$$SCR = \max\left\{\begin{array}{l} \sum_{i=1}^{n} SCR_i \,|\, \text{upwardshock on interest rate}) \\ \sum_{i=1}^{n} SCR_i \,|\, \text{downwardshock on interest rate}) \end{array}\right\}$$

where the index i refers to the calculation of SCR(Mkt_{int}) for each of the entities taken into consideration, including each with-profit fund.

Mkt_{fx}

TS.XVI.B.15 The currency risk for non-EEA countries should only apply on the net asset value minus the capital requirement of the subsidiary or the subgroup (if the net asset value of the subsidiary is 100 and its capital requirement is 80, the currency risk applies only to 100 – 80 =20).

TS.XVI.B.16 As for interest rate risk above (see TS.XVI.B.14) the effect of foreign exchange rate shocks can be calculated on the consolidated approach by working with the components of the SCR(Mkt_{fx}) calculated for each solo entity or with-profit fund. The calculation needs to take into account that upward and downward shocks on exchange rate cannot happen at the same time. The SCR(Mkt_{fx}) for the Group can then be expressed as follows:

$$SCR = \max\left\{\begin{array}{l} \sum_{i=1}^{n} SCR_i \,|\, \text{upwardshock on currency}) \\ \sum_{i=1}^{n} SCR_i \,|\, \text{downwardshock on currency}) \end{array}\right\}$$

where the index i refers to the calculation of SCR(Mkt_{fx}) for each of the entities taken into consideration, including each with-profit fund.

8. Participants are invited to provide any comments they may have on the suitability of the methods set out in the QIS4 Technical Specifications for the assessment of the components of the market risk SCR. They should also provide the rationale for any alternative approach that **they** may prefer.

Operational Risk

TS.XVI.B.17 SCR_{op} is calculated as the sum of the solo operational risk charges. This will include the 30% overall cap specified in the Standard Formula. In addition Groups should apply the Standard Formula for the operational risk module to the consolidated business of the group. Groups should also calculate SCR_{op} in this way at the consolidated level but without the 30% cap. The results of the two latter calculations will be reported as additional information.

Adjustment for the loss-absorbing effect of technical provisions

TS.XVI.B.18 Participants' attention is drawn to the fact that the loss-absorbing effect of technical provisions may be limited to certain parts of the group because of contractual or legal constraints (e.g. the legal entity of origin). When calculating the adjustment for the loss-absorbing effect of technical provisions at group level, participants should ensure that the

assumptions they make are consistent with any such contractual or legal constraints in this regard.

Adjustment for the loss-absorbing effect of deferred taxes

TS.XVI.B.19 Where the taxation regime applicable to (re)insurance groups does not allow them to benefit from tax integration for all the entities part of the group (e.g. cross-border groups), groups may use the following simplification to assess the Adjustment for the loss-absorbing effect of deferred taxes at group level:

$$Adj_{DT}^{Group} = \sum_i Adj_{DT,i}^{solo} \times \frac{SCR^{Group}}{\sum_i SCR_i^{solo}}$$

Where the index i covers all the entities of the group included in the calculation of $SCR_{wwconso}$ and:

$Adj_{DT,i}^{solo}$ is the solo Adjustment for the loss-absorbing effect of deferred taxes of entity i;

SCR^{Group} is the consolidated group SCR; and

SCR_i^{solo} is the solo SCR of entity i.

9. Participants are invited to specify if they think that the above approach is relevant at group level (without prejudice to QIS4 'solo' specifications). In particular participants may provide any evidence that operational risk exposures across different group entities have a correlation of less than 1. Please identify any inappropriate double counting that you think may arise from operational risk charges on intra-group transactions and describe the nature and size of any adjustment you think is necessary to eliminate this.

10. Groups are also asked to give detailed information on how they address group specific risks such as contagion risk, conflict of interest, legal risk, reputational risk. Both qualitative information on models applied to capture such risk (including negative effects considered, method applied, back testing etc) and quantitative outputs are requested.

11. Please set out what you consider to be the main group-specific risks and suggest how they might be quantified and addressed in a risk capital measure?

12. Please set out any views you may have on how the group standard formula has been designed in respect of:

(a) market risk,

(b) counterparty default risk,

(c) life underwriting risk,

(d) non-life underwriting risk,

(e) operational risk (including the assumptions on diversifications effects.

13. Please provide any comments you may have on the suitability of the correlation factors and aggregation methods that are set out in the Technical Specifications for the assessment of the group SCR. Please provide a rationale for any alternative approach that you may prefer.

Group Own Funds

14. Please describe any specific difficulties you encountered in the calculation of group own funds.

TS.XVI.B.20 Group own funds will be calculated by applying the solo capital specifications to the group as a whole. The balance sheet of the group, including both EEA and non-EEA entities, should therefore be calculated based on QIS4.

TS.XVI.B.21 Adjustments must be made in accordance with Article 220 of the Framework Directive Proposal to eliminate double use of eligible own funds and to limit the use of eligible elements of own funds to the group undertaking in which they are held when those elements of own funds cannot effectively be made available to cover the SCR of other group undertakings.

Total share Capital (shareholders' capital + minority interests)

TS.XVI.B.22 Group own funds should be calculated on the basis of groups' on and off-balance sheet positions valued in accordance with the solo (market consistent) valuation specifications (see Section TS.I. Participants may use their statutory accounts as a starting point which should be adjusted for valuation differences. In particular, participants should specify the amount of the adjustment due, for example, to the difference between the value of technical provision and investments calculated according to the QIS 4 valuation standards and any different standards used for individual group undertakings. The valuation of intangibles must be consistent with TS.I.A.4.

Minority interests[104]

TS.XVI.B.23 A minority interest's share in any surplus assets of a group entity in which it holds an interest is not necessarily available for use elsewhere in a group. Therefore a minority interest's share in any surplus own funds should only be included in group own funds up to the minority interest's proportional share in the group entity's SCR.

TS.XVI.B.24 In the current framework, eligible minority interests are calculated on the basis of the percentage of participation of these minority interests multiplied by the required solvency margin of the entities in which these minority interests hold –directly or indirectly- participations. In the Solvency II framework, under the consolidated approach, the solvency capital requirement for the group will not be the sum of the solo requirements (due to the recognition of some diversification benefits). Thus, it will not be possible to calculate directly the contribution of a solo entity to the group SCR. However a proxy contribution in respect of minority interest j could be calculated, resulting from the following formula:

[104] See CEIOPS website for further guidance: http://www.ceiops.eu/content/view/118/124/

$$Contr_j = SCR_j \times \frac{SCR}{\sum_{i=1}^{n} SCR_i}$$

where the index i covers all the group entities included in the calculation of $SCR_{wwconso}$.

15. CEIOPS is aware of the fact that this proposed approach results in a simplification, since there is no specific reason for which diversification benefits should come 'equally' from each undertaking of the group (that is to say that the possible reduction of the SCR obtained at group level comes equally from each undertaking, in proportion of their solo SCR). Participants are invited to suggest any alternative method for allocating diversification effects under a standard approach.

Hybrid capital

TS.XVI.B.25 These capital items (mainly non-cumulative preference shares and subordinated debt), cannot in principle be considered as transferable if not issued or guaranteed by the ultimate parent of the group (in essence, this depends on the rights of the subscribers on the revenues of these instruments). If non-transferable, they should be subject to the limitations as set out in para. TS.XVI.B.34 'non-transferable items' below.

Participations in non-EEA (re)insurance entities[105]

TS.XVI.B.26 Groups should calculate own funds in non-EEA undertakings separately from own funds in EEA undertakings on a Solvency 2 basis. Surpluses should be identified separately.

16. Eligible own funds in non-EEA undertakings are clearly available to meet the SCR of the undertaking in which they are held but a final decision has not yet been made on the extent to which surplus own funds in non-EEA undertakings should be considered transferable and hence contribute to overall available group capital. Participants are therefore requested to provide information on any legal or other barriers to the free transfer of surpluses from the non-EEA jurisdictions in which they hold capital surpluses.

Participations in other financial sector entities

TS.XVI.B.27 Groups should report for information purposes the amount of any surplus own funds in other financial sector entities that are 'consolidated' in the calculation. Surpluses should be identified separately.

TS.XVI.B.28 As regards participations that are 'not consolidated' in the group's solvency assessment, own funds in respect of such participations should be deducted from the own funds of the group.

TS.XVI.B.29 Relevant sectoral valuation rules should be applied.

With-profit business[106]

[105] See CEIOPS website for further guidance: http://www.ceiops.eu/content/view/118/124/

TS.XVI.B.30 A firm may contain items of eligible own funds and/or profit sharing mechanisms within the technical provisions, which can only be used to cover the liabilities for a limited set of policyholders, for example where a firm writes with-profit business, or protected cell or statutory lines/social insurance with participation. A set of assets, liabilities and own funds which is so restricted is termed a "fund".

TS.XVI.B.31 In line with Article 220 of the Directive Proposal, eligible own funds which are only available to cover losses in one entity should be included in the calculation of the group own funds subject to a limit. This limit should be the Solvency Capital Requirement of the related entity.

TS.XVI.B.32 As far as ring-fenced structures are concerned, participants should refer to section TS.V.C of the QIS4 specifications.

TS.XVI.B.33 Participants are therefore requested to provide information on any legal or other barriers to the free transfer of surpluses from the with-profits funds in which they hold capital surpluses.

Non-transferable assets[107]

TS.XVI.B.34 The sum of non-transferable assets valued as own funds (e.g. minority interests) should not exceed the solvency capital requirement in which these assets are located, with a specific reduction due to the diversification effects recognised in the consolidated group SCR (as per the treatment of minority interests, see TS.XVI.B.23 and TS,XVI.B.24 above). Here, the contribution to group own funds from entity j, Contrj, is limited according to the following formula

$$Contr_j = SCR_j \times \frac{SCR}{\sum_{i=1}^{n} SCR_i}$$

where the index i covers all the entities of the group included in the calculation of $SCR_{wwconso}$.

TS.XVI.C. Variation 1: Accounting consolidation method, without worldwide diversification benefits

TS.XVI.C.1 This method is calculated with group diversification benefits between EEA entities but with capital requirements for each non-EEA entity added on without taking diversification into consideration.

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[106] See CEIOPS website for further guidance: http://www.ceiops.eu/content/view/118/124/

[107] See CEIOPS website for further guidance: http://www.ceiops.eu/content/view/118/124/

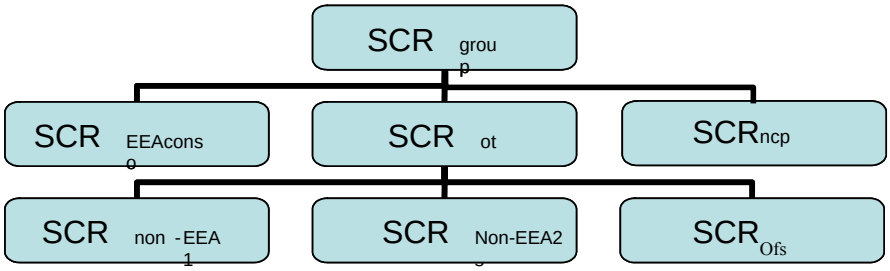
Required capital

TS.XVI.C.2 The calculations required for this method are as for the default accounting consolidation method except that diversification benefits are limited to those between EEA entities. Calculations are therefore required under the default accounting consolidation method for the consolidated business of all EEA (re)insurance undertakings, with separate capital requirements on local regulatory bases shown for any non-EEA (re)insurance undertakings. That local regulatory requirement has to be the first intervention point of the local supervisor (e.g. 200% of the USA RBC or the capital requirement from the Swiss Solvency Test for Switzerland). These non-EEA entity capital requirements will be added to the SCR for the consolidated EEA entities.

TS.XVI.C.3 In all other respects the calculations of the Required Capital under Variation 1 follow the same approach as the default accounting consolidation.

Total Group SCR

TS.XVI.C.4 The total capital requirement for the group is then calculated as the sum of the consolidated SCR at EEA level ($SCR_{EEAconso}$), the SCR for other financial sector interests (SCR_{ofs}), the SCR for non-controlled participations (SCR_{ncp}) and the capital requirements for the non-EEA operations ($SCR_{nonEEA1}$, $SCR_{nonEEA2}$, etc.). This can then be shown as a bottom-up aggregation of the SCR components as in the diagram below:



17. Please comment on the diversification effects between EEA and non-EEA business, as well as the extent to which and how these diversifications effects can or cannot be quantified?

Own funds

TS.XVI.C.5 For EEA entities, own funds should be calculated in the same way as under the default accounting consolidation method. For non-EEA entities, own funds should again be calculated in line with the default method with the following exceptions. Firstly, net assets should be assessed on the local regulatory accounting basis. Secondly, the adjustment for diversification benefits set out in TS.XVI.B.24 and TS.XVI.B.34 should not be applied to non-EEA entities as Variation 1 does not bring into account diversification benefits between EEA and non-EEA entities. Instead non-transferable own funds within each non-EEA entity are only considered eligible group own funds up to the amount of solvency capital requirement in that non-EEA entity. Then the transferable capital surplus has to be translated into the standards of the consolidated accounts in order to produce a consistent group capital surplus.

TS.XVI.D. Variation 2: Accounting consolidation-based method, but without diversification benefits arising from with-profit businesses for the EEA entities

TS.XVI.D.1 This option is tested in order to assess the extent to which diversification benefits arise from the treatment of with-profit business under the default accounting consolidation method. However this variation only applies to EEA with-profit businesses (local requirements should be applied for non-EEA with-profit businesses as in variation 1). This is because we do not know the detail of non-EEA with-profit rules and would therefore be unlikely to be able to interpret any data collected.

TS.XVI.D.2 The rationale behind variation 2 is that where a firm writes with-profit business, there may be items of eligible own funds, and profit sharing mechanisms within the technical provisions, which can only be used to cover the liabilities for a limited set of policyholders. It is all the more important to identify those items at group level because there can be several with profit businesses coming from different countries with their own specificities. Therefore, the straight application of the standard formula to the consolidated accounts might be quite complicated and difficult to interpret.

TS.XVI.D.3 As a result, the capital charge from the different with profits businesses has to be identified. This will allow an understanding in the group SCR calculation of the extent to which the future discretionary benefits of each with profit business can absorb losses in other parts of the group. This will also permit an assessment of the excess of own funds that can not be transferred to the rest of the group. A comparison of this method with the default accounting consolidated method will permit the diversification from with profit businesses to be measured and the transferability of own funds of those businesses to be analysed.

Required capital

TS.XVI.D.4 The calculations required for this method are as for the default method except that no diversification benefits are brought into account between EEA with-profit business and other group entities. Firstly, groups should calculate the SCR for each EEA with-profits business separately. Secondly, calculations are required for the consolidated businesses of all the rest of the group's business under the default method. These solo SCRs for the EEA with-profits businesses will be added to the SCR for the consolidation of the remaining entities to be compared with the result of the default method. This will demonstrate how much of the total group diversification benefits are due to diversification between EEA with-profits businesses and other group entities.

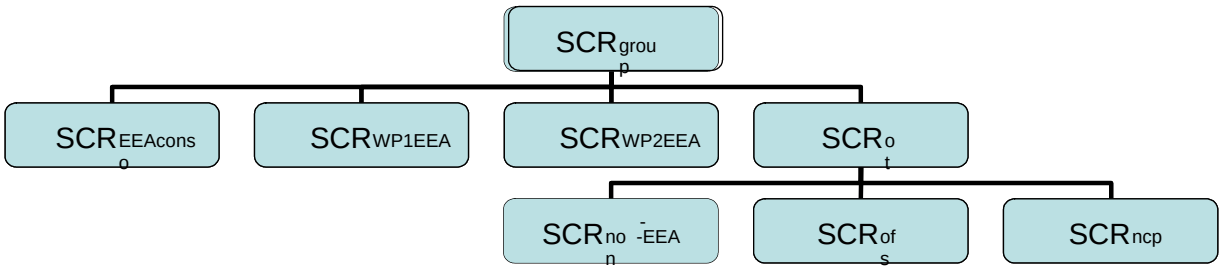
TS.XVI.D.5 Undertakings with similar restrictions on the transferability of capital, including protected cell and statutory lines/social insurance with participation, should be treated in a consistent manner.

TS.XVI.D.6 Further guidance on the treatment of with-profit business for QIS4 consistent with national laws or rules is included in the appendix.

Total Group SCR

TS.XVI.D.7 The total capital requirement for the group is then calculated as the sum of the consolidated SCR at EEA level ($SCR_{EEAconso}$) excluding EEA with profits business, the SCR for the EEA with-profit funds (SCR_{wp1EEA}, SCR_{wp2EEA} etc.), the SCR for other financial sector interests (SCR_{ofs}), the SCR for non-controlled participations (SCR_{ncp}) and the capital

requirements for the non-EEA operations. This can then be shown as a bottom-up aggregation of the SCR components as in the diagram below:



Own funds

TS.XVI.D.8 Own funds should be calculated using the same approach as Variation 1 (or the default accounting consolidation method for groups without non-EEA entities) with one exception: as Variation 2 does not bring into account diversification benefits between with-profits businesses and other group entities the limitation $Contr_j$ should not be applied to the with-profits businesses (see TS.XVI.B.24 & TS.XVI.B.34). For the with-profits businesses, instead of $Contr_j$ the non-diversified SCR in respect of those businesses should be used.

TS.XVI.E. Deduction and aggregation method (the Alternative Method set out in Article 231)

TS.XVI.E.1 This calculation applies the alternative method set out in Article 231 of the Framework Directive Proposal (deduction & aggregation). This calculates the required capital as the sum of solo SCRs of each group entity. Under QIS4 this will be calculated from the output of the solo spreadsheets. In order to distinguish intra-group effects from diversification effects when comparing the deduction and aggregation method with the accounting consolidation method adjustments are needed to eliminate market and counterparty risk charges on intra-group transactions. These are set out in the following paragraphs.

Required capital

TS.XVI.E.2 The required capital is calculated as the sum of each individual SCR for each entity in the group, including non-EEA entities, minority interests, cross-sectoral or other participations. In order to produce an accurate group position in the Solvency 2 context the solo SCRs should be adjusted to eliminate double counting of market and counterparty risk requirements on intra-group transactions.

TS.XVI.E.3 The aim is to calculate the contribution of each EEA solo entity to the SCR of the group by summing the 'solo adjusted SCRs' and adding the capital requirements of other entities where an adjusted SCR calculation cannot be readily calculated e.g. this may include non-EEA entities, minority interests or cross-sectoral or other participations. This can be expressed in the following formula:

$$SCR_{group} = \sum SCR_{solo-adjusted} + CR_{ot}$$

where the 'solo adjusted SCR' is defined as the SCR calculated at each solo entity level with the elimination of intra-group transactions (this elimination is to be carried out at each sub-module level and the SCR solo adjusted equals the total SCR of the entity multiplied by the percentage

used for the consolidated accounts). CR_{ot} is defined as the sum of the capital requirements for all other group businesses where a 'solo-adjusted SCR' cannot be readily calculated.

TS.XVI.E.4 In practice, the 'solo adjusted' SCR would be calculated for SCR_{Mkt} and SCR_{def} in the following manner:

- Regarding SCR_{Mkt}, the idea is to say that the shocks prescribed in a scenario based approach do not affect the intra-group transactions. With a factor based approach, there is a zero charge for intra-group assets.[108]

- Regarding SCR_{def}: the capital charge stemming from default risk of intra-group cedants (that is risks transferred into another entity of the group) should be taken to be equal to zero.

TS.XVI.E.5 Groups may take into account materiality considerations in calculating the adjustment for intra-group transactions. In that case, participants should explain what materiality rule was used, as well as its rationale. Participants may wish to focus on the most material intra-group transactions, e.g. financial reinsurance arrangements, loans, etc. Where participants cannot calculate the solo adjusted SCR for each single entity in the group, they may wish to calculate an overall adjustment to the sum of the solo SCRs instead, for those entities for which an adjusted solo SCR could not be calculated separately.

Group Own funds

TS.XVI.E.6 Group own funds are calculated as the own funds of the ultimate participating (re)insurance undertaking or insurance holding company plus its proportional share of the own funds in each group entity. That share is equal to the one used for the consolidated accounts. In order to eliminate the potential for double gearing, the own funds in each group entity should be based on an assessment of the solo own-funds after the deduction of participants and subsidiaries and removal of other intra-group arrangements. As under this option no diversification benefits are being considered in assessing the group SCR, there should be no adjustments in the capital resources reflecting diversification benefits. Consequently, no Contrj adjustments should be made (as in TS.XVI.B.24 and TS.XVI.B.34). Instead, the non-diversified SCR in respect of those businesses should be used.

Participants are invited to report the own funds within each of the solo entity on a deduction basis (calculated above) in order to show the location of own funds within a group.

18. Please provide any views you may have on the method proposed for calculating the solo adjusted SCRs and any alternative approach you may prefer.

[108] NB: the 'adjusted' concentration charge is the solo concentration minus the concentration charge due to intra- group assets.

TS.XVI.F. Group Capital Requirements and Capital Resources under current regime (IGD/FCD)

TS.XVI.F.1 In order to compare the proposed Solvency II measures for groups with the results obtained under the current solvency regime is also requested. The figures provided should be those resulting from the Insurance Groups Directive or Financial Conglomerates Directive, as appropriate to each group. Groups should show the group capital requirement and the available group capital resources. Groups should also indicate whether the figures have been calculated using a consolidated balance sheet approach, or using a deduction and aggregation approach.

TS.XVI.G. Group SCR Floor

TS.XVI.G.1 For the purposes of QIS4 the group SCR floor should be calculated as follows. Participants should calculate MCRs for all EEA group entities in order to establish the group SCR floor (solo MCRs available from the solo spreadsheet).

TS.XVI.G.2 The contribution of non-EEA entities and other financial sector entities to the group SCR floor should be the local capital requirement corresponding to the final intervention point of the local supervisor (i.e. the relevant minimum trigger for cessation of business e.g.100% of the USA RBC)[109].

TS.XVI.G.3 The group SCR floor is calculated as the sum of the solo MCRs for EEA group entities and the local capital requirements for non-EEA group entities and other financial sector entities, as defined in TS.XVI.G2.

TS.XVI.H. Use of an internal model[110]

TS.XI.H.1 The Directive also permits the Group SCR to be calculated using an internal model, or for elements of the Group SCR to be calculated using a partial internal model. As well as providing the information requested above on the different options on the Group SCR Standard Formula, groups are also encouraged invited to provide information on the calculation of the Group SCR using a full or partial internal model. If you have applied an internal model to calculate an alternative Group SCR or to calculate any elements of the calculation please refer to section TS.XIV for the Qualitative Questionnaire and data requests on internal models.

TS.XVI.I. Group Support

TS.XVI.I.1 The Framework Directive Proposal introduces a regime whereby subsidiaries within a group may be authorised to cover their SCR with "group support" declared by their parent undertaking under defined circumstances. The rules that apply to the use of "group support" are set out in Articles 234 to 247 of the Framework Directive Proposal.

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[109] This would seem to be the appropriate solvency level for the contribution of non-EEA entities to the group SCR floor where diversification is recognised across the whole group. It is less clear that it is appropriate under variation 1 where diversification with non-EEA entities is not recognised because this would de facto reduce the group SCR floor based on diversification for EEA entities. This is not considered to be of sufficient significance to require reporting on two different bases but CEIOPS will consider this issue in the analysis of the QIS4 results.

[110] The internal model questions for groups are integrated with those for solo entities into a separate Section 4 (TS.XIV) of these Specifications.

TS.XVI.I.2 "Group support" would constitute an eligible element of capital (ancillary own funds) at the solo level of the individual undertakings forming part of a group.

TS.XVI.I.3 To help assess the potential impact of group support regime, participants are requested to indicate the current distribution of capital between entities within the group as it results from QIS4. Detailed guidance will be given together with the spreadsheets.

TS.XVI.I.4 For QIS4 purposes groups are requested to provide the following information as if they had been granted the necessary derogation for using group support.

- the sum of the difference between the solo SCR and the solo MCR for all EEA members of the group (as "group support" would be allowed to replace other eligible elements of own funds for individual EEA group members up to this amount, this sum may be considered to be the maximum potential size of "group support" that a group may exercise).

- the sum of any deficits in the solo SCR of any EEA group member (as it would seem likely that a group would choose to use "group support" to cover such a deficit rather than face the cost of raising new capital, so this sum might be considered the minimum potential size of "group support" that a group may exercise).

19. In addition groups are requested to:

- describe the potential legal and practical barriers to the transfer of assets pledged under "group support", including any impediments to the movement of capital between subsidiaries in different jurisdictions,

- describe any existing intra-group support arrangements, including the circumstances under which they would apply and the ability of the supported entity to legally enforce them,

- describe the type of instruments they think they would use to give effect to the guarantee of "group support",

- explain the factors that might influence a groups' decision to mobilise or not to mobilise "group support",

- describe how the ability to use "group support" would affect their approach to capital management,

- describe methods used to distribute group level diversification benefits to individual group entities, and

- describe the positive and negative effects of group membership (separately identified) with regards to EEA (re)insurers, non-EEA (re)insurers, other financial sector entities, non-financial entities.

ANNEXES

TS.XVII. Annexes

TS.XVII.A Annex TP 1: Adoption of interest rate term structure methodology

TS.XVII.A.1 Abstract

The swap curve is constructed from interest rates at which a fixed rate is swapped against the 6-month EURIBOR. Unavailable maturity points are interpolated on the assumption that intervening forward rates are constant. No smoothing of the forward curve will be applied: the zero coupon spot curve has turned out to be very smooth already, and smoothing it will lead to only marginal adjustments.

TS.XVII.A.2 Underlying principles

In calculating the zero-coupon swap curve the following principles are applied. Together, they represent the best practice as found in the literature.

- The swap curve should fit known and reasonably liquid maturity points. This 'no-arbitrage' condition is characteristic of the swap market because trading tends to concentrate around full-year maturities. As this market is highly liquid, contracts are actually traded at the quoted rates (listed by e.g. Bloomberg).

- The emphasis is on a close fit in the long end of the curve. In practice, in order to keep the curve stable (no sawtooth pattern) towards the long end, the forward curve is estimated, from which the spot curve is then derived.

- Interpolations and extrapolations are based on the assumption that forwards are constant.

- It has been decided to adopt a method that is simple and easy to explain and reproduce. This means, among other things, that no smoothing is applied.

TS.XVII.A.3 Data

The data source underlying the construction of the nominal interest rate term structure will be the European swap rates for 1–10-year maturities (yearly intervals) and 12, 15, 20, 25, 30, 40 and 50-year maturities as they are listed on a daily basis by Bloomberg. In such interest rate swaps, 6-month EURIBOR is exchanged for a fixed interest rate. The rate series used will be the 'London composite rates' (code: CMPL) in Bloomberg, which may be said to reflect a market average.

The curve is based on the (lower) bid rate; Bloomberg shows a 2 basis points bid/offer spread.

The intervening maturity points up to 30 years and the 35-year and 45-year swap rates will not be used as input values for the time being. Although Bloomberg does list them, the trade in these maturity points has been decidedly less liquid.

TS.XVII.A.4 Methodology

An interest rate swap can be explained most easily as a long position in a fixed-rate bond combined with a short position in a variable -rate bond, or vice versa. According to market practice, an interest

rate swap is constructed so that no initial payment takes place – in other words, its market value is equal to nil.

As the underlying variable -rate instrument is by definition traded at par when the swap is entered into, the same must also apply to the underlying fixed-rate instrument. This implies that rates observed in the market are par yields. The interest convention of the fixed-rate side of an ordinary swap is 30/360, meaning that a month is set at 30 days and a year at 360 days. We will define the following (annually accrued) interest rates:

$$\begin{aligned} r_t &= (\text{par})\,\text{swap rate at maturity } t, \\ z_t &= \text{zero coupon swap rate at maturity } t, \\ f_{t1,t2} &= \text{forward rate between } t1 \text{ to } t2 \end{aligned}$$

The cash flows of the underlying fixed-rate bond included in a t-year swap are as follows:

date (years)	1	2	...	$t-1$	t
cash flow	r_t	r_t	...	r_t	$1+r_t$

The value at the time the swap is made equals 1 (= 100%).

The zero coupon rate is derived from the par swap rate by means of bootstrapping, starting with the 1-year swap rate.

Since $(1 + r_1) / (1 + z_1) = 1$, it follows that $z_t = r_1$. The 2-year zero coupon interest is determined by calculating the present value, at the 1- and 2-year zero rate, of the cash flows from (the fixed-rate side of) the 2-year swap, and equating this present value to 1. The 1- year zero rate is already known, so that this leaves an equation with a single unknown (the 2-year zero coupon rate):

$$\frac{r_2}{1+z_1} + \frac{1+r_2}{(1+z_2)^2} = 1,$$

which may be rewritten as:

$$z_2 = \sqrt{\frac{1+r_2}{1-\frac{r_2}{1+z_1}}} - 1.$$

z_3 through z_{10} are derived analogous ly.

By way of explanation, we also derive the 1-year forward over one year (i.e. the forward interest rate accruing between $t = 1$ and $t = 2$) via:

$$(1+z_2)^2 = (1+z_1)(1+f_{1,2}),$$

and hence:

$$f_{1,2} = \frac{(1+z_2)^2}{(1+z_1)} - 1.$$

From maturities of 10 years onwards, not all Bloomberg swap rates are used. Intervening rates are derived from the 12, 15, 20, 25, 30, 40 and 50 year maturity points. To calculate, for instance, the 21-year zero coupon rate, we need to make an assumption. Here, the assumption is made that the 1-year forward remains constant between 20 and 25 years. This is a reasonable assumption, because the forward rate is actually a prediction about the 1-year rate that will apply 20, 21 etc. years from now. The market is not very likely to take substantially different views on 1-year interest rates 20 or 21 years forward. Now, based on the assumption that $f_{20,21} = f_{21,22} = f_{22,23} = f_{23,24} = f_{24,25} = f_{20,25}$, we may write the 21-, 22-, 23-, 24- and 25-year zero rates as, respectively,

$$(1+z_{21})^{21} = (1+z_{20})^{20}(1+f_{20,21}) = (1+z_{20})^{20}(1+f_{20,25}),$$

$$(1+z_{22})^{22} = (1+z_{21})^{21}(1+f_{21,22}) = (1+z_{20})^{20}(1+f_{20,25})^2,$$

$$(1+z_{23})^{23} = (1+z_{22})^{22}(1+f_{22,23}) = (1+z_{20})^{20}(1+f_{20,25})^3,$$

$$(1+z_{24})^{24} = (1+z_{23})^{23}(1+f_{23,24}) = (1+z_{20})^{20}(1+f_{20,25})^4,$$

$$(1+z_{25})^{25} = (1+z_{24})^{24}(1+f_{24,25}) = (1+z_{20})^{20}(1+f_{20,25})^5.$$

And consequently, we may formulate the present value of the 25-year swap as:

$$\frac{r_{25}}{1+z_1} + \frac{r_{25}}{(1+z_2)^2} + \ldots + \frac{r_{25}}{(1+z_{24})^{24}} + \frac{1+r_{25}}{(1+z_{25})^{25}}$$

$$= r_{25}\left[\sum_{t=1}^{20}\frac{1}{(1+z_t)^t} + \frac{1}{(1+z_{20})^{20}}\sum_{t=1}^{5}\frac{1}{(1+f_{20,25})^t}\right] + \frac{1}{(1+z_{20})^{20}(1+f_{20,25})^5} = 1.$$

A numerical procedure is needed to solve for f20, 25. Substitution of the result in the above equations will yield z_{21} through z_{25}.

For other maturities, the calculation is analogous. For points beyond 30 years, the 1-year forward is assumed to remain constant for 10 years from 30 to 40 years and again from 40 to 50 years.

The assumption of a constant forward rate may also be used in extrapolating beyond 50 years.

Based on this latter forward rate, we may calculate spot rates for very long maturities.

TS.XVII.A.5 No smoothing

The forward curve will not be smoothed, for several reasons. The principal reason is that forwards in the long end are already fairly constant, so that smoothing would lead to only marginal adjustments in the spot curve. Differences between the 45-year spot rate as produced by a sophisticated tension spline method and that resulting from a constant forward assumption based on given 40- and 50 year rates tend to be extremely small. Furthermore, as has been noted above, the spot curve itself is already very smooth, even though the forward shows discrete jumps. As a final remark, certain smoothing techniques may lead to 'better' valuation in the shorter end of the curve, but may cause instability in the long end. Because the main focus is on the longer maturities, the drawbacks of smoothing outweigh the benefits. Moreover, the non-smoothing method is easier to understand and therefore more transparent.

TS.XVII.A.6 No discount

The bulk of the swap market is now collateralised, meaning that the moment the market value of a swap becomes negative (and hence positive to the counterparty), margin is pledged. This mechanism de facto almost eliminates credit risk. Because differences between the swap curve and government bond rates are driven in part by scarcity effects, they cannot be interpreted unequivocally as a measure of credit risk on swaps. For this reason, no discount will be applied vis-à-vis the swap curve.

TS.XVII.A.7 Other potential refinements

No adjustments were made to take account of coupon days falling on weekends or of leap years.

These factors may cause cash flows to be higher than the indicated swap rate. This applies to both the fixed and the variable rate. Because shifting of cash flows by one or two days has the strongest impact on the short end of the curve, the effects of a refinement will be strongest in that end, although still minimal (typically less than 0.1 basis point).

TS.XVII.B Annex Own funds 1: Simplification of the calculation of SCRfund i for ring fenced structures (see TS.V.C)

TS.XVII.B.1 As a simplification for step 1 of TS.V.C.6, participants can follow the following procedure:

(1) Calculate the amount of each individual risk charge at the level of the entity as a whole

(2) Disaggregate the calculated global amount of the risk charge per segment, using as a proxy the proportion relative to an appropriate exposure measure. The following table presents a list of suggestions (with appropriate justification, participants may use other exposure measures, if they are deemed to be more suitable)[111]:

Operational	Premiums + BE
Market	
Interest rate	MAX [MV(Debt instruments) * Duration (Debt instruments) - BE * Duration (liabilities); BE * Duration (liabilities) - MV(Debt instruments) * Duration (Debt instruments)]
Equity	MV (Equities)
Property	MV (Property)
Spread	MV (Debt instruments, excluding government)
Concentration	MV (5 highest group exposures)
Fx	MV (Investments in foreign currency)
Default	Exposure to derivatives + reinsurance
Life U/W	
Mortality	Capital @ Risk (on death) * Average duration
Longevity	BE (only benefits on survival)
Disability	Capital @ Risk (on disability) * Average duration
Lapse	BE (exposed to lapse risk) - Surrender value
Expenses	Renewal expenses * Average duration
Revision	*(not applicable)*
CAT	Capital @ Risk (on death) + Capital @ Risk (on disability)
Non-life U/W	*(not applicable)*
Health U/W	*(not applicable)*
KC's	BE of future discretionary bonuses

(3) For each segment separately, aggregate the individual risk charges by using the usual correlation techniques of the SCR standard formula.

TS.XVII.B.2 Note that this simplification need not cover all the segments and all the risks simultaneously, but can be combined with the results of a proper assessment for some risks and/or some segments. In particular, due to the crudeness of the suggested exposure measures, it is recommended that a proper assessment is made at least for concentration risk and the KC factors.

TS.XVII.B.3 Participants are requested to consider the following as criteria before using this simplification:

- The behaviour and linearity of the risk being disaggregated is not significantly different from fund to fund (e.g. existence of derivatives in some funds may distort the assumption of proportionality for market risk; the same applies for options and guarantees relative to underwriting risk)
- The exposure measures used are considered appropriate as a reflection of the risks being measured

[111] In particular for the KC factor, note that the amount allocated to each segment cannot exceed the technical provisions for future bonuses of that segment

TS.XVII.C Annex SCR 1: Treatment of participations and subsidiaries at solo level

TS.XVII.C.1 Participants are requested to test options 1 and 2 as described in the following paragraphs. The default option, to be used in the calculation of BSCR is option 1. In addition, on an optional basis, participants may test option 3. This annex is aimed to summarize the main features of the three options.

TS.XVII.C.2 For options 1, and 2 where an undertaking (called "the parent" below) owns a participation in another undertaking, or has a subsidiary, this participation or subsidiary should be valued on an economic basis. If a fair value treatment under IAS 39 is applied, this is considered as an acceptable proxy.

Option 1 – "differentiated equity stress" approach

TS.XVII.C.3 For all participations and subsidiaries, except those falling under TS.XVII.C.5 participants should treat these holdings in the SCR calculation as if they were an equity investment as described in the following paragraphs (i.e. by calculating a differentiated capital charge for equity risk).

TS.XVII.C.4 Under this option, when calculating the equity risk module (TS.IX.C.11) in a first step, for each index i a capital charge is determined as the result of a pre-defined stress scenario for index i as follows:

$$Mkt_{eq,i} = max\left(\Delta NAV \,\middle|\, equity\ shock_i ; 0\right)$$

where

$equity\ shock_i$ = Prescribed fall in the value of index *i* depending on the confidence level and standard deviation of the index *I*

$Mkt_{eq,i}$ = Capital charge for equity risk with respect to index *i*,

and where the equity shock scenarios for the individual indices are specified as follows:

	Global	*Other*
$equity\ shock_i$	32%	45%

For participations and subsidiaries (e.g. ownership of more than 20%) in insurance and financial undertakings included in the scope of consolidated or supplementary supervision the equity shock will be reduced to 16% for "Global" firms and to 22,5% for the "Other" participations.

The same reduction should be applied for other participations and subsidiaries in:

- Non insurance and non financial undertakings which are taken into consideration within the consolidated or supplementary supervision;
- Insurance and financial undertakings which are not included in the scope of consolidated or supplementary supervision and do not exceed the 10% of the participating undertaking's own funds.

TS.XVII.C.5 In cases where the mother owns more than 20% of another insurance or financial undertaking which 1) is not included in the scope of consolidation or supplementary supervision and 2) where the value of that participation or subsidiary exceeds 10% of the participating undertaking's own funds the calculation of the regulatory capital requirement of the parent shall be carried out using deduction and aggregation method.

TS.XVII.C.6 Concerning the concentration risk module, participations and subsidiaries are only exempted if they fall under the definition set out in TS.XVII.C.5.

Option 2: "across the board" approach

TS.XVII.C.7 Under this option all participations and subsidiaries are treated as if they were a "standard" equity investment when calculating the SCR capital charge for equity risk. They are not granted any specific treatment with respect to equity risk.

Therefore, when calculating the equity risk module (TS.IX.C.11) all equity investments, including participations and subsidiaries, should be subject to the "standard" equity shock scenarios (with no adjustment) as follows:

	Global	*Other*
equity shock$_i$	32%	45%

TS.XVII.C.8 No exemption is applied from the application of the concentration risk module.

Option 3 - "look-through" approach

TS.XVII.C.9 On an optional basis, participants may replace their solo SCR calculation, with the group SCR calculation for the sub-group formed by the participant itself (the "parent") and its subsidiaries and participations. Where this method is followed, undertakings should follow the default method set out in TS.XVI (Default method; Accounting consolidation) for the calculation of own-funds and SCR.

TS.XVII.C.10 Under this option, both the parent's own funds and SCR are to be replaced with the own funds and group SCR of the sub-group. For that purpose participants are invited to refer to TS.XVI.

TS.XVII.C.11 Where a consolidated approach is taken, participants should follow the guidance on non-life underwriting risk, counterparty default risk, life underwriting risk, market risk and operational risk within TS.XVI.B.10-B.19.

TS.XVII.C.12 Alternative own-funds/SCR calculation methods and further reporting requirements within Section 6 (QIS4 Technical Specifications for Groups) should be ignored for the purposes of the "look-through" approach.

TS.XVII.D Annex SCR 2: Standardized method to determine undertaking-specific parameters (standard deviations for premium and reserve risk)

TS.XVII.D.1 For the purposes of QIS4, the set of replaceable parameters consists of the following:

- In relation to the non-life premium and reserve risk, the standard deviations $\sigma_{(prem,lob)}$ and $\sigma_{(res,lob)}$ as defined in paragraph TS.XIII.B.21 for each of the lines of business given in paragraph TS.XIII.B.6;

- In relation to the health short-term sub-module, the standard deviations $\sigma_{(prem,lob)}$ and $\sigma_{(res,lob)}$ for the lines of business 'short term health' and 'accident & others';

- In relation to the workers compensation sub-module, the standard deviations $\sigma_{(prem,lob)}$ and $\sigma_{(res,lob)}$ for the line of business 'workers compensation'.

TS.XVII.D.2 Participants may substitute all or any subset of the replaceable parameters by undertaking-specific estimates.

TS.XVII.D.3 The undertaking-specific parameters shall be derived applying a standardized method defined as follows.

Standardized method to determine $\sigma_{(prem,lob)}$

TS.XVII.D.4 Input data of the standardised method are a time series of net loss ratios $LR_1, \ldots, LR_n$ and time series of corresponding net earned premiums $P_1, \ldots, P_n$.

TS.XVII.D.5 The undertaking-specific parameter shall derived from the input data by means of the following formula:

$$\sigma_{(prem,lob)} = \sqrt{\frac{1}{(n-1)\cdot V_{(prem,lob)}} \cdot \sum_{1\le y\le n} P_y \cdot (LR_y - \mu)^2} \ ,$$

where $V_{(prem,lob)}$ is defined as in TS.XIII.B.23 and $\mu = \frac{\sum_y P_y \cdot LR_y}{\sum_y P_y}$.

TS.XVII.D.6 The above formula for $\sigma_{(prem,lob)}$ uses the premiums P_y to weight the estimations $(LR_y - \mu)^2$. This approach is based on the assumption that the variance of LR is inversely proportional to the premiums P. If other weights (e.g. sum insured) are more likely to be inversely proportional to the variance of the loss ratio, the time series $P_1, \ldots, P_n$ shall be replaced by these weights. In this case $V_{(prem,lob)}$ needs to be amended accordingly in the above formula. (The volume measure for the line of business should stay the same though.)

TS.XVII.D.7 The input data for the standardized method should be derived from internal data of the undertaking or from data which is directly relevant for the operations of the undertaking. The data should be complete, accurate and appropriate to the above estimation. In particular,

the time series LR_1, …, LR_n should be representative for the expected business of the following year, including the risks acquired and the risks transferred (e.g. by reinsurance).

TS.XVII.D.8 With regard to the risk of the business, the length of the time series LR_1, …, LR_n should ensure a reliable estimation of $\sigma_{(prem,lob)}$. The length n should be disclosed.

Standardized method to determine $\sigma_{(res,lob)}$

TS.XVII.D.9 Input data of the standardised method are a time series of net run-off ratios RR_1, …, RR_n and time series of corresponding net best estimate provisions for claims outstanding PCO_1, …, PCO_n. The net run-off ratio is defined as the ratio.

$$RR_y = \frac{RunOff_y}{PCO_y},$$

where *RunOff* is the absolute run-off result of the undiscounted net best estimate provision PCO_y for a time horizon of one year.

TS.XVII.D.10 The undertaking-specific parameter shall derived from the input data by means of the following formula:

$$\sigma_{(res,lob)} = \sqrt{\frac{1}{n \cdot V_{(res,lob)}} \cdot \sum_{1 \le y \le n} PCO_y \cdot (RR_y - 0)^2},$$

where $V_{(res,lob)}$ is defined as in TS.XIII.B.22.

TS.XVII.D.11 The above formula for $\sigma_{(res,lob)}$ uses the provision for claims outstanding PCO_y to weight the estimations $(RR_y - 0)^2$. This approach is based on the assumption that the variance of *RR* is inversely proportional to the provisions *PCO*. If other weights are more likely to be inversely proportional to the variance of the run-off ratio, the time series PCO_1, …, PCO_n shall be replaced by these weights. In this case $V_{(res,lob)}$ needs to be amended accordingly in the above formula. (The volume measure for the line of business should stay the same though.)

TS.XVII.D.12 The input data for the standardized method should be derived from internal data of the undertaking or from data which is directly relevant for the operations of the undertaking. The data should be complete, accurate and appropriate to the above estimation. In particular, the time series RR_1, …, RR_n should be representative for the expected business of the following year, including the risks acquired and the risks transferred (e.g. by reinsurance). In general, run-off ratios derived from provisions which are not on best estimate level (as defined in TS.II) should not be considered to be appropriate, unless the equivalence of their volatility can be demonstrated.

TS.XVII.D.13 With regard to the risk of the business, the length of the time series RR_1, …, RR_n should ensure a reliable estimation of $\sigma_{(res,lob)}$. The length n should be disclosed.

TS.XVII.E Annex SCR 3: Method 2 NL_{Cat} risk scenarios

As described in TS.XIII.C.2, in QIS4 the NL_{Cat} risk sub-module can be calculated following two alternative methods: standard approach and, where available, regional scenarios. In addition, on an optional basis, participants may use personalised scenario.

This annex compiles the available regional scenarios provided by the local supervisors.

Austria	• ***Flood*** (the 2002 flooding serves as basis): participants have to take the higher of a) and b). (c) The companies have to calculate the impact of this flooding with the assumption that the same loss frequency will occur, but with a higher average loss by 10%. (d) The companies have to take their market share multiplied by the market loss of a 2002 flooding (increased by approx. 10% to reflect inflation). The market loss is approx. €560 million. The result of this scenario is = max (a; b) • ***Hailstorm***: it is assumed that 5% of the earned premiums in LOB "Other Motor" are needed to cover one single event. • ***Windstorm*** (the 2000 storm serves as a basis): participants have to take the higher of a) and b). (e) The companies have to take the historical loss ratios of the year 2000 in the relevant LOBs and apply them to the current premium income. The expected value of the loss ratio e.g. 60% could be deducted (has to be discussed). (f) In 2000 an average loss ratio for the LOB "Windstorm" of 250% was experienced. The companies have to take this ratio and apply it to the current premium income. The result of this scenario is = max (a; b). The above scenarios have to be calculated on a gross basis and afterwards the reinsurance programme has to be applied.
Belgium	• The capital charge to cover the event of ***floods*** which corresponds to the insurance undertaking's market share multiplied by the market loss of the 2002 series of floods, increased by 10% to reflect inflation to date. The 2002 market loss was approximately € 360 million, for the lines of business *Fire & Other Property Damage* and *Motor Other Classes*. • The capital charge to cover the event of ***windstorms*** which corresponds to the impact on the insurance undertaking's net asset value of the 1990 windstorm Daria, under the assumption of the same 1990 loss frequency

	with an average higher loss by 20% to reflect inflation to date. The impact should be assessed for the lines of business *Fire & Other Property Damage* and *Motor Other Classes*. • The capital charge to cover the event of ***earthquakes*** which corresponds to the impact on the company's net asset value of the 1983 earthquake, under the assumption of the same 1983 loss frequency with an average higher loss by 20% to reflect inflation to date. The impact should be assessed for the lines of business *Fire & Other Property Damage* and *Motor Other Classes*. • With respect to ***man-made*** catastrophe scenarios, companies should either select the most severe scenario from the list provided in paragraph TS.XIII.C.24, or specify themselves a man-made catastrophe scenario corresponding to a 1 in 200 year event. The capital charges of the above scenarios have to be calculated on a net basis taking into account the risk mitigating effect of the reinsurance programme currently in place.
Czech Republic	• ***Flood*** resulting in a market loss of € 1.8 billion affecting property insurance
Denmark	• A ***non-NBCR man-made*** event causing a total loss to the company's largest single property risk, including EML failure and resulting loss to other contracts; ***Windstorms*** • One windstorm resulting in a market loss of € 3½ billion; • Two windstorms each resulting in a market loss of € 2 billion. NB: it is assumed here that all firms buy reinsurance such that the upper limit at least equals the 99.5%ile standard required by the SCR. The market losses should be divided into classes, according to how these were affected by Anatol (see the tabular "Market loss in Denmark resulting from Anatol (as-at ultimo 2001) - breakdown into classes of business"), and subsequently distributed on companies using the market shares of gross premiums earned in each class in 2006 (use the tabular "Gross premiums earned in Denmark in 2006 - breakdown into classes of business" for the calculation)[112].

Market loss in Denmark resulting from Anatol (as-at ultimo 2001) - breakdown into classes of business

Classes		Anatol		Regional QIS4 windstorm scenarios	
		Gross loss	Percentage	Scenario no. 1	Scenario no. 2
				€ 3,5 bn.	2 x € 2 bn.[113]
		(€ 1.000)	(Rounded off)	(€ 1.000)	(€ 1.000)
1	Workmen's compensation	€ 272	0%	€ 0	€ 0
2	Insurance on buildings	€ 954.347	57%	€ 1.995.000	€ 1.140.000
3	Insurance on contents	€ 110.503	7%	€ 245.000	€ 140.000
4	Professional indemnity insurance	€ 83	0%	€ 0	€ 0
5	Marine and transport insurance	€ 38.061	2%	€ 70.000	€ 40.000
6	Aviation	€ 0	0%	€ 0	€ 0
7	Other commercial insurance	€ 3.819	0%	€ 0	€ 0
8	**Total commercial insurance**	€ 1.107.085	66%	€ 2.310.000	€ 1.320.000
9	Private insurance	€ 10.639	1%	€ 35.000	€ 20.000
10	House owner's comprehensive	€ 363.990	22%	€ 770.000	€ 440.000
11	Weekend and seaside cottage insurance	€ 36.816	2%	€ 70.000	€ 40.000
12	Other private insurance	€ 2.717	0%	€ 0	€ 0
13	**Total private insurance**	€ 414.162	25%	€ 875.000	€ 500.000
14	Single accident and sickness insurance	€ 108	0%	€ 0	€ 0
15	Professional disability insurance	€ 0	0%	€ 0	€ 0
16	**Total personal accident insurance**	€ 108	0%	€ 0	€ 0
17	Third party liability	€ 87	0%	€ 0	€ 0
18	Vehicle (own damage)	€ 42.587	3%	€ 105.000	€ 60.000
19	**Total motor vehicle insurance**	€ 42.674	3%	€ 105.000	€ 60.000
20	Credit and surety ship	€ 0	0%	€ 0	€ 0
21	Assistance	€ 0	0%	€ 0	€ 0
22	Legal expenses	€ 0	0%	€ 0	€ 0
23	**Total direct business**	€ 1.564.030	94%	€ 3.290.000	€ 1.880.000
24	Indirect non-life insurance	€ 109.638	6%	€ 210.000	€ 120.000
25	Indirect life assurance	€ 0	0%	€ 0	€ 0
26	**Total indirect business**	€ 109.638	6%	€ 210.000	€ 120.000
27	**Total**	€ 1.673.668	100%	€ 3.500.000	€ 2.000.000

	Gross premiums earned in Denmark in 2006 - breakdown into classes of business [114] **Classes** / **Gross premium earned (€ 1.000)** 1 Workmen's compensation — € 519.234 2 Insurance on buildings — € 507.250 3 Insurance on contents — € 423.204 4 Professional indemnity insurance — € 199.659 5 Marine and transport insurance — € 152.500 6 Aviation — € 119.242 7 Other commercial insurance — € 94.345 8 **Total commercial insurance** — € 2.015.434 9 Private insurance — € 444.953 10 House owner's comprehensive — € 495.461 11 Weekend and seaside cottage insurance — € 64.994 12 Other private insurance — € 170.184 13 **Total private insurance** — € 1.175.592 14 Single accident and sickness insurance — € 1.074.494 15 Professional disability insurance — € 47.679 16 **Total personal accident insurance** — € 1.122.173 17 Third party liability — € 696.934 18 Vehicle (own damage) — € 987.008 19 **Total motor vehicle insurance** — € 1.683.942 20 Credit and surety ship — € 53.999 21 Assistance — € 6.526 22 Legal expenses — € 3.281 23 **Total direct business** — € 6.060.946 24 Indirect non-life insurance — € 151.879 25 Indirect life assurance — € 176.880 26 **Total indirect business** — € 328.759 27 **Total** — € 6.389.705
France	***Natural catastrophe scenario*** • A major flood in the Paris area from the Seine, resulting in an estimated insurance industry loss of €5 billion; • Two windstorms (1999 storms Lothar and Martin) resulting in a market loss of €14 billion; • An earthquake in the South east coast of France (could be regarded as a trans-national scenario) resulting in a market loss of €15 billion. ***Man-made scenario*** Participants should select their most severe man-made CAT risk scenario, either from the list below, or by specifying an individual man-made CAT risk scenario corresponding to a 1 in 200 year event:[115] • Two insured aircraft, having the highest exposures for the firm to aircraft, colliding over a major city with the highest exposure for the

	firm; • Extreme motor accident, such as a level crossing accident causing a train crash with severe loss of life or a chemical spill resulting in contamination and poisoning; • Total loss to the largest single property risk, including PML failure and resulting loss to other contracts; • Terrorist attack or aircraft crash in a sport or musical event, involving a high number of people and affecting seriously the premise and its surroundings; • Third party liability: Major consumer product (including pharmaceutical) withdrawal with extensive health damage claims; • Third party liability: Major drinking water pollution disaster.
Germany	This section covers the risk of loss, or of adverse change in the value of insurance liabilities, resulting from significant uncertainty of pricing and provisioning assumptions related to natural catastrophe events in Germany, namely: • storm risk in commercial and private property insurance, • flood risk in commercial and private property insurance, • risk in commercial and private property insurance, • natural hazard risk (hail, storm, lightning and flood risk) in motor comprehensive insurance. This section does not cover man-made CAT risk. Therefore, participants have to revert to the level 1 specifications for these risks. The following formula should be applied to quantify the man-made risks and to aggregate the resulting capital charge with the requirement for natural catastrophes NL_{NatCAT}: $$NL_{CAT} = \sqrt{NL_{NatCat}^2 + \sum_{t\in\{1,5,6,7,8,9,11\}} (c_t \cdot P_t)^2 + (c_3 \cdot P_3 + c_{12} \cdot P_{12})^2 + (0.10 \cdot P_4 + c_{10} \cdot P_{10})^2}$$ where c_t and P_t are defined as in paragraph TS.XIII.C.6 of the QIS4 specifications. ***Aggregation of natural catastrophe sub-risks*** The capital charge NL_{NatCAT} for natural catastrophe risk is determined by aggregating the capital requirements for storm risk, flood risk, earthquake risk in property insurance and natural hazard risk in motor insurance by means of the linear correlation technique and a correlation matrix as follows:

	Property Storm	Property Flood	Property Earthquake	Motor Nat hazard
Property, Storm	1			
Property, Flood	0.1	1		
Property, Earthquake	0	0	1	
Motor, Nat hazard	0.6	0.1	0	1

Storm risk in property insurance

The capital required for the storm risk in property insurance is derived as follows:

$$NL_{CAT,Storm} = \max(r_{Storm} \cdot 1.15‰ \cdot R_{Storm} \cdot V_{Storm} - X_{2,Storm};0)$$

$$+ \min(r_{Storm} \cdot 1.15‰ \cdot R_{Storm} \cdot V_{Storm}; X_{1,Storm})$$

where

r_{Storm} = the relative risk retention of quota share reinsurance in storm insurance, home owners comprehensive insurance and extended coverage (EC),

R_{Storm} = the regional exposure factor for storm risk,

V_{Storm} = the sum insured for storm insurance, home owners comprehensive insurance and extended coverage comprised in the insurer's portfolio at the balance sheet date,

$X_{1,Storm}$ = the retention of the storm CAT XL or SL[116] for storm insurance, home owners comprehensive insurance and EC,

$X_{2,Storm}$ = the ceiling of the storm CAT XL or SL for storm insurance, home owners comprehensive insurance and extended coverage.

The regional exposure factor R_{Storm} is derived as follows:

$$R_{Storm} = \frac{\sum_K (RI_{Storm,K}/100) \cdot V_{Storm,K}}{V_{Storm}},$$

Where:

$RI_{Storm,K}$ = the regional storm index of postcode area K,[117]

	$V_{Storm,K}$ = the sum insured for storm insurance, home owners comprehensive insurance and extended coverage comprised in the insurer's portfolio at the balance sheet date in postcode area K. If storm insurance, home owners comprehensive insurance and EC are not reinsured under a common quota, the means of the individual retentions weighted by the sums insured should be applied to r_{Storm}. The formula above refers to cases where the storm CAT XL/SL is applied to the retention of the quota contract. If, in deviation from this, the quota coverage is calculated after the retention of the storm CAT XL/SL has been applied, the formula can be adjusted by inserting in $X_{1,Storm}$ and $X_{2,Storm}$ the storm values CAT XL/SL less the retention r_{Storm}. Other specifics of reinsurance coverage can be taken into account with the options of the variables r_{Storm}, $X_{1,Storm}$ and $X_{2,Storm}$, if justified under risk theoretical aspects. For example, cross-sectoral, cross-company or facultative covers can be included using appropriate modifications. ***Flood risk in property insurance*** The capital required for the flood risk in property insurance is derived as follows: $NL_{CAT,Flood} = \max(r_{Flood} \cdot 0.84‰ \cdot V_{Flood} - X_{2,Flood};0)$ $+ \min(r_{Flood} \cdot 0.84‰ \cdot V_{Flood}; X_{1,Flood})$ Where: r_{Flood} = the relative risk retention of quota share reinsurance in property insurance, V_{Flood} = the sum insured for property insurance in the insurer's portfolio at the balance sheet date; policies which exclude flood risk shall not be taken into account, $X_{1,Flood}$ = the retention of the CAT XL or SL for flood risk, $X_{2,Flood}$ = the ceiling of the CAT XL or SL for flood risk. If the portfolio under flood risk is not reinsured under a common quota, the means of the individual retentions weighted by the sums insured should be applied to r_{Flood} . The formula above refers to cases where the flood CAT XL/SL is applied to the retention of the quota contract. If, in deviation from this, the quota coverage is calculated after the retention of the flood CAT XL/SL has been applied, the formula can be adjusted by inserting in $X_{1,Flood}$ and $X_{2,Flood}$ the values for CAT XL/SL less the retention r_{Flood}. Other specifics of reinsurance coverage can be taken into account with the options of the variables r_{Flood}, $X_{1,Flood}$ and $X_{2,Flood}$, if justified under risk

theoretical aspects. For example, cross-sectoral, cross-company or facultative covers can be included using appropriate modifications.

Earthquake risk in property insurance

The capital required for the earthquake risk in property insurance is derived as follows:

$$NL_{CAT,EQ} = \max(r_{EQ} \cdot 0.93‰ \cdot R_{EQ} \cdot V_{EQ} - X_{2,EQ};0)$$

$$+ \min(r_{EQ} \cdot 0.93‰ \cdot R_{EQ} \cdot V_{EQ}; X_{1,EQ}),$$

Where:

r_{EQ}	=	the relative risk retention of quota share reinsurance in property insurance,
V_{EQ}	=	the sum insured for property insurance in the insurer's portfolio at the balance sheet date; policies which exclude earthquake risk shall not be taken into account,
R_{EQ}	=	the regional exposure factor for earthquake risk,
$X_{1,EQ}$	=	the retention of the CAT XL or SL for earthquake risk,
$X_{2,EQ}$	=	the ceiling of the CAT XL or SL for earthquake risk.

The regional exposure factor R_{EQ} is derived as follows:

$$R_{EQ} = \frac{\sum_K (RI_{EQ,K}/100) \cdot V_{EQ,K}}{V_{EQ}}$$

Where:

$RI_{EQ,K}$	=	the regional earthquake index of postcode area K,[118]
$V_{EQ,K}$	=	the sum insured for property insurance in the insurer's portfolio at the balance sheet date in postcode area K; policies which exclude earthquake risk shall not be taken into account.

If the portfolio under earthquake risk is not reinsured under a common quota, the means of the individual retentions weighted by the sums insured should be applied to r_{EQ}.

The formula under point above refers to cases where the earthquake CAT XL/SL is applied to the retention of the quota contract. If, in deviation from this, the quota coverage is calculated after the retention of the earthquake CAT XL/SL has been applied, the formula can be adjusted by inserting in $X_{1,EQ}$ and $X_{2,EQ}$ the values for CAT XL/SL less the retention r_{EQ}.

Other specifics of reinsurance coverage can be taken into account with the options of the variables r_{EQ}, $X_{1,EQ}$ and $X_{2,EQ}$, if justified under risk theoretical aspects. For example, cross-sectoral, cross-company or facultative covers can

be included using appropriate modifications.

Natural hazard risk in motor comprehensive insurance

The capital required for the natural hazard risk in motor comprehensive insurance is derived as follows:

$$NL_{CAT,Motor} = \max(r_{Motor} \cdot MSB \cdot R_{Motor} \cdot N - X_{2,Motor};0)$$

$$+ \min(r_{Motor} \cdot MSB \cdot R_{Motor} \cdot N; X_{1,Motor})$$

Where:

r_{Motor}	=	the relative risk retention of quota share reinsurance in motor comprehensive insurance,
MSB	=	€65,
R_{Motor}	=	the regional exposure factor for natural hazard in motor insurance,
N	=	the number of contracts in motor comprehensive insurance within the last business year prior to the balance sheet date,
$X_{1,Motor}$	=	the retention of the CAT XL or SL for motor comprehensive insurance,
$X_{2,Motor}$	=	the ceiling of the CAT XL or SL for motor comprehensive insurance.

The regional exposure factor R is calculated as follows:

$$R_{Motor} = \frac{\sum_{ZB} (RI_{Motor,ZB}/100) \cdot N_{ZB}}{N}$$

Where:

$RI_{Motor,ZB}$	=	the regional natural hazard index for the registration district ZB[119]
N_{ZB}	=	the number of contracts in motor comprehensive insurance in the registration district ZB within the last business year prior to the balance sheet date.

In case the comprehensive insurance portfolio is not reinsured under a common quota, the means of the individual retentions weighted by the sums insured should be applied to r_{Motor}.

The formula above refers to cases where the CAT XL/SL is applied to the retention of the quota contract. If, in deviation from this, the quota coverage is calculated after the retention of the storm CAT XL/SL has been applied, the formula can be adjusted by inserting in $X_{1,Motor}$ and $X_{2,Motor}$ the storm values CAT XL/SL less the retention r_{Motor}.

	Other specifics of reinsurance coverage can be taken into account with the options of the variables r_{Motor}, $X_{1,Motor}$ and $X_{2,Motor}$, if justified under risk theoretical aspects. For example, cross-sectoral, cross-company or facultative covers can be included using appropriate modifications.
Hungary	• A market loss approach is specified below for ***earthquake, flood and windstorm*** exposures. In the market loss approach, the gross exposure relating to each NatCAT event is determined as $CAT_i^{(gross)} = ML_i \cdot \frac{P_u}{P_m}$, where ML_i = estimated gross market loss corresponding to a 200-year event (as specified by the supervisor) P_m = market total of gross premiums for the Fire and property line of business in the reference year 2007 (specified by the supervisor) P_u = the participant's gross written premiums for the Fire and property line of business in the reference year 2007 • The parameters specified by the Hungarian supervisor are the following: P_m = 520 million euros $ML_{earthquake}$ = 705 million euros ML_{flood} = 50 million euros $ML_{windstorm}$ = 25 million euros • The net capital charge for each NatCAT event is determined from the gross charge taking into account the participant's reinsurance agreements in place at the reference date.
Italy	• An ***earthquake***, resulting in an estimated market loss of €8 billion (affecting insurance class: fire). • A ***flood***, resulting in an estimated market loss of €1 billion (affecting insurance classes: to be determined by undertakings).
Iceland	***Windstorms*** • One windstorm resulting in a market property loss of ISK 6 Billion (€60 Million). • Two windstorms each resulting in a market property loss of ISK 2 Billion

	(€20 Million). • The side effects on other classes as motor and liability should be taken into account, based on the estimated experience of the storms in December 2007 and January 2008, as follows: 0,75*(PML_M + PML_C) Where: PML_M = Probable Maximum Loss of the company in Marine insurance; PML_C = Probable Maximum Loss of the company in Cargo insurance.
Lithuania	***Property insurance*** Companies have to take the higher of 1) and 2): 1) windstorm in one region with the biggest number of insured objects causing in 0.2% of property being damaged and fall in the value by 30%; 2) one building with the biggest total amount insured got burnt and 50% of sum insured should be paid. ***Motor Third Party Liability insurance*** Loss frequency increased by 10%. ***Motor insurance, other*** One accident with probable maximum loss gross of reinsurance for 10000 valid contracts. ***General liability*** One accident with probable maximum loss gross of reinsurance. ***Suretyship*** One accident with probable maximum loss gross of reinsurance. ***Credit*** 10% of policyholders failed to pay the loan and the price of the real estate fell down by 30%. The above scenarios have to be calculated on a gross basis and afterwards the reinsurance programme has to be applied. The aggregated CAT risk is determined as follows: CAT = max (property 1; property 2) + Motor TPL + Motor other + General liability + Suretyship + Credit

Malta	***Natural CAT scenarios:*** • Storms causing twice as much damage as the 2003 storms. • An earthquake, resulting in an estimated insurance market loss of 2.68% of the capital at risk, affecting property insurance policies. This corresponds to an expected 200-year event. ***Man made CAT scenarios:*** • The insolvency of a major bank; • An aircraft crash in a densely populated area in Malta
Norway	***The Nat-Cat Scenario*** In order to treat the Norwegian Natural Perils Pool (NNPP) in an adequate manner the non-life insurance undertakings should consider the Nat-Cat scenario specified by the supervisor. In practise, the scenario is based on e.g. the premium rates for the compulsory insurance against natural perils and the reinsurance programme for the NNPP in force as at 31 December 2007. As a basis for the assessment of the Nat-Cat risks the non-life insurance under-takings are exposed to, it is assumed that two Nat-Cat events will incur during the one year time horizon (that is during 2008). The Nat-Cat events are likely to be either windstorms or floods. However, due to the construction of the NNPP, it is not necessary to distinguish between the different kinds of Nat-Cat events. The overall claims payments are stipulated to NOK 5 billion (EUR 625 million) per event. The other main assumptions for the Nat-Cat scenarios may be summarised in the following manner: • The premium rate for the Nat-Cat cover is 0.11 pro mille of the sums insured, corresponding to overall Nat-Cat premiums of NOK 1 130 million (EUR 141 ¼ million) in 2008. • A distinction is made between claims payments for "ordinary" natural perils and claims payments for catastrophic natural perils, respectively. The claims ratio for "ordinary" natural perils is fixed at 30 per cent. (This figure is a rather rough estimate based on the experiences with the NNPP since 1980.) • The NNPP's reinsurance programme covers claims in excess of NOK 600 million (EUR 75 million) per Nat-Cat event and consists of four methods, cf. table 1 below. • The premium rate for the second reinstatement is stipulated to be 50 per cent higher than the premium rate for the first reinstatement. • For the first Nat-Cat event the counterparty risk amounts to 5 per cent of the reinsurers' overall commitments vis-à-vis the NNPP. For the second Nat-Cat event the counterparty risk amounts to 10 per cent of

the reinsurers' overall commitments vis-à-vis the NNPP.

- The reinsurance programme is re-established after each Nat-Cat event.

In order to simplify the calculations the administrative expenses related to the Nat-Cat insurance arrangement are disregarded. (Alternatively, it may be assumed that these expenses are included in the claims payments.)

Table 1. Reinsurance program for the Norwegian Natural Perils Pool in 2008.

Methods (beyond the retention)	Reinsurance premiums	Reinstatement premiums
NOK 1 000 million XS NOK 600 million	NOK 101.5 million	10.15 per cent
NOK 1 400 million XS NOK 1 600 million	NOK 74.9 million	5.35 per cent
NOK 3 000 million XS NOK 3 000 million	NOK 88.5 million	2.95 per cent
NOK 6 500 million XS NOK 6 000 million	NOK 81.3 million	1.25 per cent

By applying the assumptions summarised above (including the brief description of the reinsurance programme in table 1) the total partial capital charge related to Nat-Cat risks for all non-life insurance undertakings participating in the NNPP is estimated to NOK 2 000 million (EUR 250 million) in 2008. The details regarding this calculation are given in Kredittilsynet's note "A scenario-based approach for Nat-Cat risks in non-life insurance" dated 18 February 2008.

The partial capital charge for an individual undertaking ($NL_{Nat\text{-}CAT}$) is fixed by multiplying the total partial capital charge (*TPCC*) referred to above by the undertaking's share of the current Nat-Cat premiums (Q_{NP}), that is

$$NL_{Nat\text{-}CAT} = Q_{NP} \times TPCC$$

It should be noticed that the method of calculation sketched above is applied in a similar manner to stipulate the part of the natural perils fund managed by the undertaking in question that is counted as available capital (ΔNPF), that is

$$\Delta NPF = min(NL_{Nat\text{-}CAT}, NPF),$$

where *NPF* denotes the undertaking's natural perils fund as at 31 December 2007. Alternatively, ΔNPF could be regarded as a risk-mitigating effect when stipulating the partial capital charge for Nat-Cat risks.

Scenarios for Other Cat Risks

With respect to other Cat risks ("man made" Cat risks), the non-life insurance undertakings should consider at least two scenarios related to motor insurance (and especially the third party liability part) and workers' compensation insurance, respectively.

As a supplement to the specified scenarios the undertakings are asked to consider Cat risks being relevant to fire insurance and the marine insurance. A slightly more detailed description of this scenarios is given in Kredittilsynet's note "Scenario-based approaches for other Cat risks in non-life insurance" dated 18 February 2008.

- ***A scenario related to motor insurance***

A catastrophic scenario corresponding to an explosive fire in the Oslofjord-tunnel or another large tunnel in the Oslo area should be considered. The overall claims cost on a gross basis (PML) related to this scenario is stipulated to NOK 800 million (EUR 100 million).

It should be taken into consideration that all claims arising from this catastrophic event will be classified as liability claims. Accordingly, the claims costs related to this event will in general be covered (paid) by one single company.

- ***A scenario related to workers' compensation insurance***

A catastrophic event hitting a firm with many employees – leading to a large number of employees being either killed or made (totally) disabled – should be considered.

In a reference alternative – based on a firm having 400 employees – the overall claims costs on a gross basis (PML) related to this scenario are stipulated to NOK 1 billion (EUR 125 million). The undertaking should, however, adapt this scenario to its maximum exposure or maximum risk.

- ***Other scenarios***

As a supplement to the two scenarios described above, the non-life insurance undertakings should estimate their maximum claims costs on a gross basis (PML) regarding property damage due to a large fire, and in this context take into consideration the accumulation risk related to the fire scenario. Especially, the undertakings should assess whether this scenario should be included in the calculation of the partial capital charge for catastrophic risks.

Moreover, non-life insurance undertakings that write marine business are asked to assess relevant catastrophic scenarios for this kind of business and include the impact of such scenarios in the calculation of the partial capital charge for catastrophic risks.

- ***The partial capital charge for other Cat risks***

As it is reasonable to assume that the "man-made" scenarios referred to above are independent, the partial capital charge for other catastrophic risk ($NL_{Man-CAT}$) is stipulated in the following manner:

$$NL_{Man-CAT} = (\sum_K (NL_{Man-CAT,K})^2)^{1/2},$$

where $NL_{Man-CAT,K}$ denotes the partial capital charge related to scenario no. K.

	Overall capital charge for catastrophic risks in non-life insurance The specific features of the Norwegian Natural Perils Pool (NNPP) should be taken into account also when the overall capital charge for catastrophic risks in non-life insurance is stipulated. In order to do this in a simple, but still adequate, manner the capital charge is fixed by simply adding the partial capital charges related to the Nat-Cat scenario and the "man-made" scenarios, respectively: $NL_{CAT} = NL_{Nat\text{-}CAT} + NL_{Man\text{-}CAT}$. In this context, it may also be referred to the fact that for an undertaking writing Nat-Cat business a part of the undertaking's natural perils fund will be counted as available capital.
Poland	The supervisor in Poland has decided not to give any examples of non-life catastrophes within method 2
Portugal	***Earthquake*** • An earthquake, resulting in an estimated loss of 1.11% of the capital at risk for property insurance policies exposed to seismic perils. This scenario corresponds to an expected 250-year event. • Participants are invited to include the estimate of the impact that such earthquake would have on the other lines of business.
Slovakia	• ***Flood*** (the 2002 flooding basis) resulting in a market loss of 1,500 million EUR (affecting property insurance). • ***Windstorm*** (the 2004 windstorm basis) - The companies have to take the historical loss ratio of the year 2004 in the relevant LOBs and apply the to the current premium income. The above scenarios have to be calculated on a gross basis and afterwards the reinsurance programme has to be applied.
Slovenia	• ***Earthquake*** in capital city with a return period of 250 years • ***Financial crisis*** with default of 5% of all Credit insurance (exposure for company).
Sweden	• A ***storm*** resulting in a market loss of €1,500 million (Affecting insurance class: Fire and other property damage). • A ***financial crisis*** resulting in a market loss of €200 million (Affecting insurance class: Credit and suretyship). • An ***epidemic*** resulting in a market loss of €100 million (Affecting insurance class: Accident and health-others/default).
UK	The supervisor in the UK has decided not to give any examples of non-life

	catastrophes within method 2.

TS.XVII.F Annex SCR 4: Concentration risk in Denmark

TS.XVII.F.1 Danish life insurance undertakings have heavily invested in Danish mortgage bonds because in many situations they provide a reasonable match for life insurance liabilities, as well as interest rate risk. Furthermore, the Danish market for mortgage bonds is very liquid and listed on a stock exchange.

TS.XVII.F.2 In Denmark, only a few large mortgage institutes supply the market with mortgage bonds. This means that a large proportion of a typical life insurance company's assets will be invested in mortgage bonds issued by these institutes. In QIS3 it was noted that this leads to a very high concentration risk charge.

TS.XVII.F.3 However, since all mortgage bonds are backed with security in each borrower's property, the concentration risk towards the institute is very low. But this is not captured in the current QIS4 setup. Therefore it might be argued that the concentration risk charge on life insurance undertakings holding this kind of investments is unreasonably high.

TS.XVII.F.4 It should be noted that, in the investment diversification rules as currently laid down in article 24 (4) of Directive 2002/83/EC, securities as described above are subject to a limit of 40 % instead of 5 %, which actually reflects the recognition of the more secure nature of such securities. These diversification rules will not apply under Solvency II anymore, because they will be replaced by an SCR capital charge capturing the same type of risk, namely the concentration risk associated with these investments. The text in the footnote in TS.IX.G.11 is therefore proposed in order to better reflect this specificity in the QIS4 specifications.

TS.XVII.G Annex SCR 5: Dutch health insurance

Risk mitigation in the Dutch health insurance system

TS.XVII.G.1 Two important features of the Dutch health insurance system are:

(a) compulsory health insurance for Dutch citizens for a standard health insurance policy; and

(b) a mandatory equalisation system for health insurance companies offering the standard health insurance policy[120].

TS.XVII.G.2 In its current form the equalisation system consists of two stages. The first, *ex ante*, stage results in payments from insurers with a relatively healthy population to insurers with less healthy customers. The second balancing stage leads to *ex post* (partial) payments from insurers with relatively good stochastic results in a given year to insurers with less favourable outcomes. It is self-evident that this equalisation system results in a substantial smoothing of the results of an individual insurer. In other words, the underwriting risk of Dutch health insurers is less volatile and consequently its business can be considered less risky.

TS.XVII.G.3 A system based on historical data (i.e. results after equalisation) automatically makes the volatility reduction due to equalisation visible and, if insurers have sufficient historical loss data, the Solvency II requirements will automatically produce an appropriate, risk based outcome. Without sufficient available data, however, insurers will be required to fall back on the prescribed parameters of the standard formula. These parameters do not take into account the risk mitigating effect of equalisation schemes.

TS.XVII.G.4 Because the equalisation system has been operational since 1 January 2006 only, there is insufficient data available to use undertaking-specific data for QIS4 purposes. For QIS4, it has therefore been decided to test a refinement of the underwriting risk parameters in the SCR standard formula, to deal with the health insurance operations subject to the Dutch equalisation scheme.

Explanatory specifications

TS.XVII.G.5 In QIS4, participants will test the possibility to replace the SCR standard parameters with values which reflect the reduction in underwriting risk due to the equalisation system in place for compulsory standard Dutch health insurance.

TS.XVII.G.6 The parameter values to be adjusted are the standard deviations for both the premium risk and reserve risk for the health insurance LOB. In order to calculate the corresponding values for the Dutch standard health insurance, a separate set of equalisation parameters needs to be added to the standard model for health insurance subject to the risk mitigating effects of equalisation.

TS.XVII.G.7 As it is possible for Dutch health insurers to conduct both compulsory and voluntary health insurance, it will be necessary to calculate the adequate values of the standard deviation for the premium risk and reserve risk by splitting the specific parameter values for the compulsory health insurance from the EU parameter values for the voluntary health insurance.

TS.XVII.G.8 The annual input of the equalisation parameters will be drawn from the market wide analysis of the standard deviation per standard health insured, producing the amount of

reduction that is involved in the various sub-modules of the equalisation system. Basically, to monitor the Dutch equalisation parameters such an analysis will be updated annually, depending on changes of the equalisation system.

TS.XVII.G.9 In 2004, a study was performed on the risk absorbing effects of future profit sharing. At that time the following sub-modules of the equalisation system were distinguished: *ex ante* risk equalisation and *ex post* claims equalisation (containing the sub-modules: high claims pooling, (partial) technical result pooling and (partial) technical result compensation).

TS.XVII.G.10 Prior to any equalisation, the (gross) standard deviation of the claim amount per insured is calculated. Subsequently exercising the sub-modules of the *ex post* claims equalisation this (gross) standard deviation reduces to:

- DELTA0: standard deviations of the claims after exercising the ex ante risk equalisation module based on age/gender only;
- DELTA1: standard deviations of the claims after exercising the ex ante risk equalisation module based on all morbidity variables;
- DELTA2: standard deviations of the (residual of) claims after exercising the high claims pooling sub-module in the ex post claims equalisation;
- DELTA3: standard deviations of the (residual of) claims after exercising the (partial) technical result pooling sub-module in the ex post claims equalisation;
- DELTA4: standard deviations of the (residual of) claims after exercising the (partial) technical result compensation sub-module in the ex post claims equalisation.

TS.XVII.G.11 The 2004 study was performed on the total population of Dutch sickness funds (over 12.2 million insured persons). The following results per insured were found:

Amounts per insured (in €)	Gross claim	Result after exercising equalisation sub-module				
		DELTA 0	DELTA 1	DELTA 2	DELTA 3	DELTA 4
Average claim c.q. result	1.246	0	0	0	0	0
Standard deviation (STD)	4.830	3.043	2.786	1.588	1.236	971
STD relative to gross claim STD	100%	63%	58%	33%	26%	20%

TS.XVII.G.12 Thus the following values for the risk mitigation parameters were calculated:

Risk mitigation parameter for	Gross claim	After equalisation sub-module				
		DELTA0	DELTA1	DELTA2	DELTA3	DELTA4
Premium risk	100%	63%	58%	33%	26%	20%
Reserve risk	100%	25%	23%	13%	10%	8%

TS.XVII.G.13 As a consequence of the equalisation system having its effect on the ultimate gross loss, there is only a minor difference in volatility between premium risk and reserve risk to be expected. For this reason the risk mitigation parameters for premium risk and reserve risk are chosen differently, i.e. the mitigation parameters for the reserve risk follow from multiplying the mitigation parameters for the premium risk with 3/7½ (= the quotient of the respective EU parameter values for reserve risk and premium risk for health insurance). However, further investigation will be needed to actually underpin this choice.

TS.XVII.G.14 There is an ongoing process of upgrading the equalisation system providing more predictive power in the *ex ante* part of the equalisation system. From this it must be expected that the government's incentive to abolish *ex post* claims equalisation modules as much as possible will become a reality. In that respect, the (partial) technical result pooling (DELTA3) has been abolished as from 2008 on. By the time Solvency II is expected to be in force the (partial) technical result compensation (DELTA4) may have been diminished to a great extent as well. Apart from any unforeseen changes in the equalisation system, this would indicate that for now the DELTA2 related risk mitigation parameter could be considered as a most realistic figure for the near future time.

TS.XVII.G.15 Adjustment to standard parameters to take account of the Dutch situation:

Standard parameter values for health insurance should be reduced in the following way:

- from 3% to 1% (= 0.33*3%) for the premium risk, and
- from 7½% to 1% (= 0.13*7½%) for the reserve risk.

TS.XVII.H Annex SCR 6: UK alternative disability risk-sub-module within Life underwriting

Description

TS.XVII.H.1 The treatment of disability risk is intended to reflect uncertainty risk in trends and parameters, to the extent these are not already reflected in the valuation of technical provisions.

TS.XVII.H.2 It is applicable to the class of insurance contracts where benefits are payable contingent on a definition of disability[121]. Capital charges are calculated for the following broad types of disability cover:

- Income Protection – claims are related to the policyholder becoming unable to work for a prolonged period of time as a result of illness or accidental injury
- Critical Illness – claims are single payment benefits related to the policyholder experiencing a specified critical illness or event, not covered by long-term care.
- Long-Term Care – claims are related to the policyholder suffering illness or disablement resulting in entry into long-term care.

For ease of reference we have referred to Income Protection, Critical Illness and Long-Term Care as "disability types" below.

Input

TS.XVII.H.3 The following input information is required:

Dis_{IP} = Capital charge for income protection underwriting risk

Dis_{CI} = Capital charge for critical illness underwriting risk

Dis_{LTC} = Capital charge for long term care underwriting risk

$nDis_{IP}$ = Capital charge for income protection underwriting risk including the risk mitigating effect of future profit sharing.

$nDis_{CI}$ = Capital charge for critical illness underwriting risk including the risk mitigating effect of future profit sharing.

$nDis_{LTC}$ = Capital charge for long term care underwriting risk including the risk mitigating effect of future profit sharing.

Output

TS.XVII.H.4 The module delivers the following output:

$Life_{dis}$ = Capital charge for disability risk[122]

$nLife_{dis}$ = Capital charge for disability risk including the risk absorbing effect of future profit sharing

Calculation

TS.XVII.H.5 The capital charge for disability underwriting risk is derived by combining the capital charges for the underwriting risk in respect of the disability types using a correlation matrix as follows:

$$Life_{dis} = \sqrt{\sum_{rxc} CorrDis \bullet Dis_r \bullet Dis_c}$$

where

$CorrDis^{rxc}$	=	the cells of the correlation matrix *CorrDis*
Dis_r, Dis_c	=	Capital charges for individual types of disability underwriting risks according to the rows and columns of correlation matrix *CorrHealth*

and where the correlation matrix CorrDis is defined as:

CorrDis	Dis_{IP}	Dis_{CI}	Dis_{LTC}
Dis_{IP}	1		
Dis_{CI}	0.5	1	
Dis_{LTC}	0.5	0.75	1

The capital charge for $nLife_{dis}$ is determined as follows:

$$nLife_{dis} = \sqrt{\sum_{rxc} CorrDis_{r,c} \cdot nDis_r \cdot nDis_c}$$

Capital charge for the underwriting risk in respect of each disability type

TS.XVII.H.6 The capital charge for disability underwriting risk in respect of each disability type is based on an increase in the rate at which policyholder claims become payable (the claims rate) combined with a capital charge for a decrease in the rate at which, to the extent relevant, policyholders recover so that claims cease to be paid (recovery rates).

TS.XVII.H.7 The following input is required:

$Claims_r$ = capital charge for the underwriting risk in relation to claims within disability type r (IP, CI or LTC)

Rcv_r = capital charge for the underwriting risk in relation to recoveries within disability type r (IP, CI or LTC)

$nClaims_r$ = capital charge for the morbidity risk within disability type r (IP, CI or LTC) including the risk mitigating effect of future profit sharing

$nRcv_r$ = capital charge for the recovery risk within disability type r (IP, CI or LTC) including the risk mitigating effect of future profit sharing

TS.XVII.H.8 Dis_r and $nDis_r$ are determined as follows:

$$Dis_r = \sqrt{(Claims_r^{\ 2} + Rcv_r^{\ 2})}$$

$$nDis_r = \sqrt{(nClaims_r^{\ 2} + nRcv_r^{\ 2})}$$

Capital charge for the underwriting risk in respect to claims

TS.XVII.H.9 The capital charge for underwriting risk in relation to claims is defined as the result of a claims scenario as follows:

$$Claim_r = \sum_i (\Delta NAV \mid claimsshock)$$

where the subscript i denotes each policy where the payment of benefits (either lump sum or multiple payments) is contingent on claims risk and r is the disability type. The other terms represent:

ΔNAV	=	Change in the net value of assets minus liabilities
$Disshock$	=	Increase of 35% in claims rates for the next year, together with a (permanent) 25% increase (over best estimate) in claims rates at each age in following years

TS.XVII.H.10 The claims scenarios should be calculated under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the shocks being tested.

TS.XVII.H.11 Additionally, the result of the scenario should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nClaims_r$.

Capital charge for the underwriting risk in respect to claims

TS.XVII.H.12 The capital charge for underwriting risk in relation to recovery risk is defined as the result of a recovery scenario as follows:

$$Rcv_r = \sum_i (\Delta NAV \mid rcvshock)$$

where the subscript i denotes each policy where the payment of benefits (either lump sum or multiple payments) is contingent on recovery risk and r is the disability type. The other terms represent:

ΔNAV	=	Change in the net value of assets minus liabilities
$Rcvshock$	=	A permanent decrease of 25% in recovery rates (under best estimate) at each age in following years.

TS.XVII.H.13 The recovery scenarios should be calculated under the condition that the assumptions on future bonus rates (reflected in the valuation of future discretionary benefits in technical provisions) remain unchanged before and after the shocks being tested.

TS.XVII.H.14 Additionally, the result of the scenario should be determined under the condition that the participant is able to vary its assumptions in future bonus rates in response to the shock being tested. The resulting capital charge is $nRcv_r$.

TS.XVII.I Annex SCR 7: Alternative approach to assess the adjustment for the loss-absorbing capacity of the TP and deferred taxes – background document on the "single equivalent scenario"

TS.XVII.I.1 The SCR is the amount of capital a firm requires in order to be able to withstand the most onerous 1-in-200 scenario. This document describes a technique which enables us to allocate the diversified SCR capital back to the individual risks, in order to see the relative importance of each risk in the SCR. We can use this process to determine what the "single equivalent scenario" actually looks like.

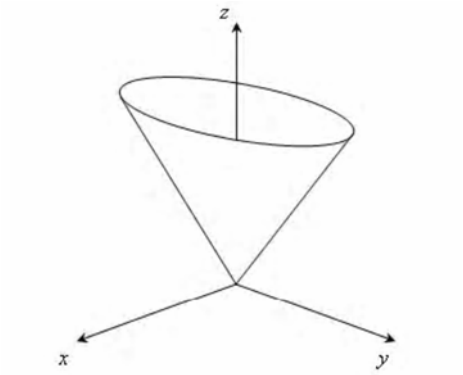
TS.XVII.I.2 We start by expressing the diversified SCR formulaically:

$$D = \sqrt{\sum_{i=1}^{n}\sum_{j=1}^{n}\rho_{ij}c_i c_j}$$

In this formula, n is the number of risks, ci is the capital requirement for risk i, and ρij is the correlation coefficient for the pair of risks i and j. The post-diversification capital requirement is D.

TS.XVII.I.3 Here, C is the "capital vector". This is the collection of the capital requirements from all the individual risks. M is the correlation matrix, which contains the correlation coefficients for every pair of risks. As before, D is the post-diversification capital requirement.

TS.XVII.I.4 This formula can be thought of as a mapping or a function. For a given correlation matrix, it maps every possible capital vector to a corresponding post-diversification amount. If there were only two individual risks then you could plot this function in three dimensions, as shown in the diagram below. In this example, the individual capital requirements from the two risks have been plotted on the x-axis and the y-axis, with the resultant post-diversification amount on the z-axis. The shape is an inverted elliptic cone, with its apex at the origin. In an SCR context, we are just interested in the quarter of the cone where x and y are both positive.



TS.XVII.I.5

The way to interpret this diagram is as follows: If the capital requirements for the two risks are known to be xo and yo, then locate the point (xo, yo) in the xy-plane and from there go "up" until you hit the surface of the cone. From this point, you can go "across" to the z-axis and read off the post-diversification capital requirement.

TS.XVII.I.6 If the two risks were uncorrelated then the shape would be a regular cone, and a "horizontal" cross-section would show a circle centred on the z-axis. If the two risks were partially positively correlated, this circle would be stretched along the line "x = -y" to form an ellipse. If the two risks were fully correlated, this stretching would reach a limit and the ellipse would break into two parallel lines. It is possible to plot these shapes using Excel.

TS.XVII.I.7 We would like to find a linear approximation to the SCR formula. In other words, we would like to come up with a set of coefficients which gives us a linear mapping from the individual capital requirements to the post-diversification amount. This is useful, because we can then view these coefficients as weights. These weights will show us the degree to which each individual risk contributes to the post-diversification capital requirement.

TS.XVII.I.8 But given C, M and D, we could come up with infinitely many sets of coefficients, all of which would map C to D. So which set of coefficients should we choose?

TS.XVII.I.9 As we said earlier, we are trying to find a linear approximation to the formula on the previous page. We want to find the "best" approximation. We can easily find lots of approximations which hold for any given C, M and D. But the "best" approximation is the one which would still hold for small changes in C. In other words, the approximation would still be very good even if the capital requirements for the individual risks changed by a small amount.

Returning to our three-dimensional example, we want to find the plane which not only passes through the "right" point on the cone, but which is tangential to the cone at that point. As you might expect, we can find this tangent by differentiation.

TS.XVII.I.10 Differentiating D with respect to C gives us:

$$\frac{\partial D}{\partial \mathbf{C}} = \frac{\frac{1}{2}}{\sqrt{\mathbf{C}^{\mathrm{T}}\mathbf{M}\mathbf{C}}}(\mathbf{M}\mathbf{C} + \mathbf{M}^{\mathrm{T}}\mathbf{C}) = \frac{\frac{1}{2}}{D} 2\mathbf{M}\mathbf{C} = \frac{1}{D}\mathbf{M}\mathbf{C}$$

TS.XVII.I.11 Therefore, for a given capital vector C0 and post-diversification amount D0, we define the coefficients or weights using:

$$\mathbf{W} = \frac{1}{D_0}\mathbf{M}\mathbf{C}_0$$

TS.XVII.I.12 For those who prefer to avoid using matrix notation, we can obtain the same result by calculating the weight for each risk separately. This requires partial differentiation of D with respect to the capital requirement for an individual risk, while assuming all else remains constant.

$$\frac{\partial D}{\partial c_k} = \frac{\frac{1}{2}}{D} 2\sum_{i=1}^{n} \rho_{ik} c_i = \frac{1}{D}\sum_{i=1}^{n} \rho_{ik} c_i$$

TS.XVII.I.13 Therefore if the capital requirement for risk i is known to be c0i, then the weight for risk k would be defined as:

$$w_k = \frac{1}{D_0}\sum_{i=1}^{n}\rho_{ik}c_{0i}$$

This definition of the weights gives us the linear approximation we are looking for. We already know that D0 is the capital required to withstand the most onerous 1-in-200 scenario. This most onerous scenario is what we call the "single equivalent scenario". This formula helps us to understand what that scenario looks like, because the weights indicate the degree to which each individual risk crystallises in that scenario. And even without constructing the scenario, the weights enable us to see how the post-diversification amount can be notionally allocated across the individual risks, to show the relative importance of each risk in the SCR.

TS.XVII.I.14 This definition of the weights has two interesting properties. Firstly:

$$\mathbf{C}_0^{\mathrm{T}}\mathbf{W} = \frac{1}{D_0}\mathbf{C}_0^{\mathrm{T}}\mathbf{M}\mathbf{C}_0 = \frac{D_0^{\,2}}{D_0} = D_0$$

TS.XVII.I.15 Or equivalently:

$$\sum_{k=1}^{n} w_k c_{0k} = \frac{1}{D_0}\sum_{k=1}^{n}\sum_{i=1}^{n}\rho_{ik}c_{0i}c_{0k} = \frac{D_0^{\,2}}{D_0} = D_0$$

TS.XVII.I.16 This merely confirms that if we multiply each of the individual capital requirements by its corresponding weight then the sum of these weighted amounts is indeed the post-diversification amount. In other words, applying the weights to the pre-diversification amounts has the same effect as applying the SCR formula, so we have indeed found a linear approximation to that formula.

TS.XVII.I.17 In our three-dimensional example, the plane does indeed pass through the "right" point on the cone.

TS.XVII.I.18 Secondly, if M is invertible:

$$\mathbf{W}^{\mathrm{T}}\mathbf{M}^{-1}\mathbf{W} = \frac{1}{D_0}\mathbf{W}^{\mathrm{T}}\mathbf{M}^{-1}\mathbf{M}\mathbf{C}_0 = \frac{1}{D_0}\mathbf{W}^{\mathrm{T}}\mathbf{C}_0 = \frac{1}{D_0}\mathbf{C}_0^{\mathrm{T}}\mathbf{W} = \frac{D_0}{D_0} = 1$$

TS.XVII.I.19 This is an elegant result when expressed in matrix notation. However, it is of limited use for the purpose of identifying a linear approximation.

TS.XVII.I.20 There may be other sets of weights which also exhibit these two properties. However, the definition of the weights given above is the most appropriate one to use, as it is the most immune to small changes in the individual capital requirements.

TS.XVII.I.21 If the matrix contains any negative correlations, then it is possible that some of the weights could be negative. If the weight for a particular risk is negative, this means that a small increase in the capital requirement for that risk would lead to a decrease in the post-diversification capital requirement (and simultaneously, the weight for that risk would become less negative). This situation is perfectly logical. It does not indicate that the matrix is not internally consistent.

TS.XVII.I.22 In this document, we have ignored the effects of non-linearity and grossing up in identifying the weights. In reality, these effects could cause the actual SCR to be greater than D0. This means that the scenario we have found may not necessarily be the most onerous. It is possible to use an iterative process to home in on the true SCR scenario in a way that automatically allows for non-linearity, but that is beyond the scope of this document and beyond the practicality of the standard formula.

TS.XVII.J Annex SCR 8: Alternative approach to assess the capital charge for equity risk, incorporating an equity dampener – background document provided by French authorities

TS.XVII.J.1 **Rationale for a new approach to equity risk**

1. A risk-based prudential regime will require companies investing in risky assets to hold capital in order to be able to face their liabilities even in bad times. This "prudent person principle" is a key feature of a system based on the full responsibility of companies.

2. As equities are concerned, we deem essential that the standard formula further reflects this economic philosophy of "one size does not fit all". The protection of consumers, the returns on their investment, the competitiveness of our insurers and more generally the funding of the European economy are at stake :

   a) Risk sensitive regulatory financial requirements should provide incentives for optimal alignment of risk management by the insurer and regulation. The design of capital requirement on equity should therefore promote optimal investment practices by insurers. Those best practices clearly consist in aligning the investment strategy with the features of liabilities. This corresponds to an actual asset-liability management, which the new solvency system should encourage.

   b) The risks addressed by solvency rules should be assessed according to the nature of the business of the companies. Investment in equity should result in a capital charge that is adapted to the economic logic of the insurers' investment:

      - First, investment in equity contributes to a correct diversification of assets, by avoiding an overexposure to bonds alone;

      - Second, investment in equity provides a better return (or lower prices) for policyholders over the long term. In particular, it guarantees a better coverage of inflation risk. This is desirable both in non-life where most of liabilities depend on prices index and in life where the amount of lump sums or annuities paid to beneficiaries should be in correspondence with the price level at the time they are paid.

   c) From a macroeconomic perspective, the European sector should be recognized as a strong and stable institutional investor in the very structure of Solvency II. This role has to be fully reflected in the design of the standard formula because this formula will play an important role, both as the actual capital requirement for most companies and, as a generally accepted reference for market participants (insurance undertakings, investors, rating agencies, etc.):

      - A distortion in the relative prices of assets would result in higher prices for consumers and in a decrease of the insurers' share in the funding of the economy.

      - Deterring insurance undertakings from contributing to this important function would therefore be inconsistent with European political objectives of the "Lisbon agenda". Fostering a fair treatment of the insurers' investment is in line with one of the main challenges of the current and future financial directives reviews: removing relevant outstanding obstacles in Member States' legislations to investment in private equity/venture capital by institutional investors.

- It is all the more important that the current demographic changes will result in imbalances in public pension system based on "repartition", pushing the financing burden onto the shoulders of future generations unless we foster individual or group retirement saving schemes to maintain an acceptable income stream for retirees. A new solvency regime for insurance companies should not prevent insurance companies from offering a good return for this supplemental retirement schemes insofar as their investment policy strikes the right balance between security and return.

3. In consequence, a new formula has been provided during the QIS4 consultation period.

TS.XVII.J.2 **Proposal for a new equity approach in the standard formula**

4. CEIOPS has suggested substituting to the equities formula tested in QIS 3 another formula based on the « dampener approach ». Such an approach is currently used by the UK FSA and reduces the capital requirement when the equities' value is lower than its mean computed on the last 90 days.

5. The theoretical basis of the « dampener » is based on the fact that the probability that the value of equities raises is smaller when this value is high than when it is low. It is then based on the phenomenon called "mean reversion" of returns on equities: returns on equities are going back to their mean on the long run.

6. This phenomenon justifies that the capital requirement for equities should be modulated according to the position in the financial cycle. It should take into account the mean value of equities relative to observed cycle, reflecting the volatilities of the trend and of the cycle of the equities' value.

7. The main characteristics of the dampener we propose are the following:

   – First, the « mean reverting » phenomenon is observed when equities' value increases or decreases. Therefore, the "dampener" mechanism should be symmetric, raising the capital requirement when the equities' value is high and reducing it when it is low.

   – Second, while being consistent with the solvency one-year horizon, the « dampener » effect should be all the more taken into account than the time horizon of the company is long. Therefore, the relative weight of the cycle's volatility should decrease with the duration of liabilities. More, when the duration of liabilities is very short (less than 2 years), the "dampener" formula should not be used (revert to the CEIOPS approach with a 32% capital requirement).

   – Third, the mean of the equities' value has to be computed on a one year time horizon sufficiently long to match the solvency horizon prescribed in the draft directive.

TS.XVII.J.3 **Proposed technical specifications for the equity sub-module**

8. The equity module requires two preliminary computations:

   - a de-trending of the value of equities over one year to get its cyclical component (c_t);

   – an approximation of the duration of liabilities (of more than two years) (k).

9. The SCR equity module is then based on a formula calibrated to the 99.5% VaR over a one year horizon, conditionally to the cyclical component and to the duration of liabilities:

$$SCR^{equities} = [\alpha \,.\, VaR(k, c_t) + (1 - \alpha)\, 32\,\%]\,.\; value\ of\ equities$$

, where

- α , share of technical provisions accounting for more than 3 year commitments;
- $VaR(k, c_t) = F(k) + G(k).\, c_t$
- *F(k)* and *G(k)*, coefficient(s) provided by the following table:

Liabilities' duration	*F(k)*	*G(k)*
3-5 years	29 %	0,20
5-10 years	26 %	0,11
10-15 years	23 %	0,08
More than 15 years	22 %	0,07

10. Results are then intuitive:

- When the cycle component is positive, the capital requirement increases ; when it is negative, it decreases (symmetric dampener effect);
- The dampener effect is all the more important than the time horizon for the investment is longer (the duration of liabilities being a proxy for this time horizon).

11. The complexity of the formula may be addressed by several simplifications:

- The company may use a European index or national indices (in proportion to the share of national equities in the insurer's portfolio) as a proxy of its equities' value;
- The company may use the mean durations provided by their supervisor(s) for their lines of business (in proportion to the technical provision of each lines of business).

TS.XVII.K ANNEX Groups Specifications 1: abbreviations

Abbreviations used in the Groups Specifications for the risks and sub-risk contributing to the Solvency Capital Requirement are the same as those in the solo specifications.

Other abbreviations used in the Groups Specification are:

SCR_{op} = The capital charge for operational risk

$SCREEA_{conso}$ = The capital charge for EEA countries

SCR_{group} = The capital charge for the insurance group at its highest level

SCR_{wp} = The capital charge for a specific with-profits entity

$SCR_{non\text{-}EEA}$ = The capital charge for non-EEA countries

$SCR_{wwconso}$ = The capital charge on a worldwide basis

SCR_{ofs} = The capital charge for other financial sector entities

SCR_{nop} = The capital charge for participations where no relationship of control exists

SCR_{ot} = The capital charge for the total of SCR_{ofs} and SCR_{nop} and $SCR_{non\text{-}EEA}$

$SCR_{solo\text{-}adjusted}$ = the capital charge calculated at the level of each solo entity with the elimination of intra-group transactions.

TS.XVII.L Annex Composites: summary of the main provisions in the Directive Proposal

TS.XVII.L.1 Articles 72 and 73 of the Directive Proposal set out the treatment to be applied to composite insurance companies, i.e. companies carrying both life and non-life direct insurance operations. Basically, the treatment of composite insurance companies is similar to the treatment of other insurers, with two exceptions: composite insurers are required to draw separate accounts with respect to their life and non-life activities (see article 73(6)); and composite insurers have to comply with two additional notional capital requirements, namely a notional life MCR and a notional non-life MCR (see article 73(2).

TS.XVII.L.2 Drawing separate accounts should enable composite insurance companies to identify those basic own funds which relate to their life insurance business, as well as those basic own funds which relate to their non-life insurance business. This should also enable those companies to carry out the separate MCR calculations mentioned in TS.XVII.L.4.

TS.XVII.L.3 Composite insurance companies should calculate one SCR only, i.e. the (usual) diversified SCR covering both the life and non-life business. This SCR can be covered by the total amount of own funds of the company, related to both the life and non-life business (see article 73(4)).

TS.XVII.L.4 On the other hand, composite insurance companies should carry out three MCR calculations, as set out in paragraphs TS.XV.B.2 and TS.XV.B.5 of the QIS4 specifications:

- a notional life MCR, which relates to life business only;
- a notional non-life MCR, which relates to non-life business only; and
- the (usual) MCR, which covers both the life and non-life business.

As a principle, composite insurance companies should not cover the notional MCR relating to one activity with basic own funds stemming from the other activity (see Article 73(3)). Concretely, they should be in a position to cover their notional life MCR with the basic own funds relating to life business, whilst covering their notional non-life MCR with the basic own funds relating to non-life business.

In addition they should be in a position to cover their (usual) MCR with the total amount of their own funds, stemming from both the life and non-life business, as any other (re)insurer.